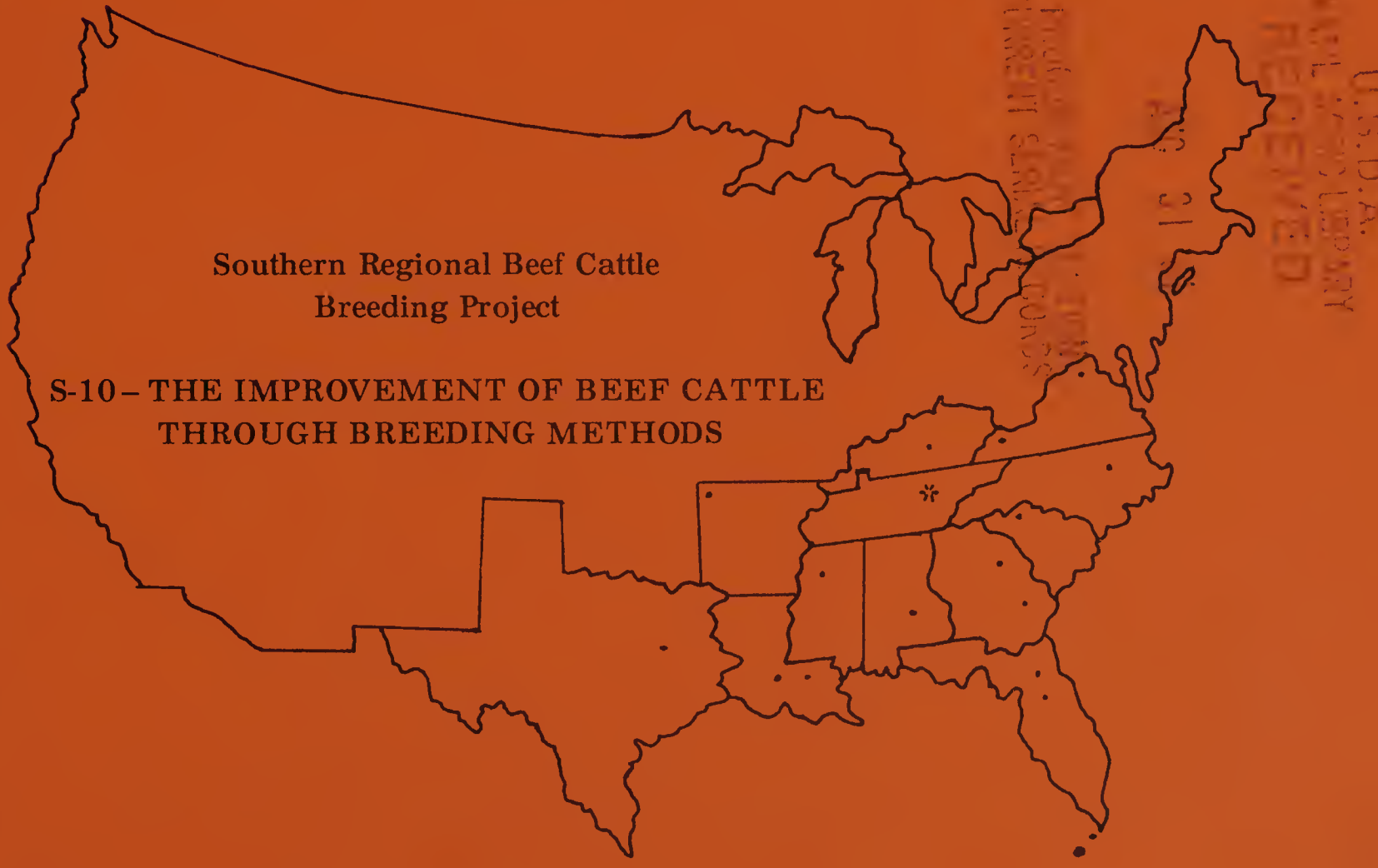
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HUSBANDRY RESEARCH DIVISION
and
COOPERATING SOUTHERN STATES

1968-1969 Annual Report of S-10
and
Report of Annual Technical Committee Meeting
North Carolina State University
Raleigh, North Carolina
June 9-11, 1969



Southern Regional Beef Cattle
Breeding Project

S-10 – THE IMPROVEMENT OF BEEF CATTLE
THROUGH BREEDING METHODS

This report is intended for the use of administrative leaders and workers and is not for general publication.

CONTENTS

INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the South. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Complete results of certain phases of the project have been reported in regional bulletins and technical articles and bulletins published by workers in the various states which contribute to the S-10 project.

This publication includes the proceedings of the 1969 annual meeting of the S-10 Technical Committee and the annual reports of projects in each of the twelve contributing states. The annual reports of S-10 contributing and supporting projects were prepared by the project leaders and other personnel at the various stations as summaries of the research developments and progress at each station during 1968. The results are not considered final, but the materials aid cooperators in developing an integrated program. This report also provides information needed by heads of animal husbandry departments, experiment station directors, and U. S. Department of Agriculture officials for evaluation of the projects with respect to objectives and procedures. <u>This report is not for general distribution and material contained in it should not be quoted in publications</u>.

ANNUAL MEETING

S-10 TECHNICAL COMMITTEE MEETING

North Carolina State University
Raleigh, North Carolina

June 9-11, 1969

Monday, June 9
Fitzpatrick Room, Polk Hall

Presiding: J. E. Legates

8:30 a.m.	Welcome	R. L. Lovvorn
8:45	Genotype-Environment Interactions as Revealed by the Brooksville-Miles City Project	Will Butts
9:30	Genetics of the Growth Curve and its Selection Implications	H. A. Fitzhugh, Jr.
10:15	Break	

Presiding: J. W. Turner

10:30	Station Progress Reports	
	Alabama	T. B. Patterson
	Arkansas	C. J. Brown
	Florida	M. Koger
	Brooksville	W. C. Burns
12:00	Lunch	
1:00 p.m.	Visit facilities for North Carolina Project at University Farms	
3:30	Visit crossbreeding project of John Umstead Hospital at Butner	
6:00	Picnic at Lake Side Recreation Center, Butner	
7:00	U. S. Meat Animal Research Center Program	Larry V. Cundiff

Tuesday, June 10
Fitzpatrick Room, Polk Hall

Presiding: J. E. Legates

8:30 a.m.	Epistasis and Linkage in Relation to Breeding Problems	C. Clark Cockerham

9:15	Selection for a Maternal Trait in Mice	E. J. Eisen
10:00	Break	

Presiding: J. W. Turner

10:15 Station Progress Reports:

Georgia	W. C. McCormick
Kentucky	Fred Thrift
Louisiana	J. W. Turner
Jeanerette	D. C. Meyerhoeffer

11:30	Influence of Condition Upon Maternal Performance in Beef Cattle	Robert McDaniel
12:00	Lunch	
1:00 p.m.	Visit to Reproductive Physiology Laboratory	
2:00	Visit to Animal Husbandry Beef Projects	
3:30	Evaluation of Breeding Values of Beef Bulls Will Butts, Chairman	
	Present Status, Needs and Potential for Beef Sire Evaluation	Will Butts
	Evaluation Procedures for Dairy Sires and Possible Adaptation to Beef Cattle	J. E. Legates
	Discussion and Summary	Will Butts
6:30	Dinner	

Presiding: T. C. Cartwright

Speaker: Dr. W. T. Berry, Jr., Executive Secretary
The American Hereford Association

"We Must Lead to Survive"

Wednesday, June 11
Fitzpatrick Room, Polk Hall

8:30 a.m.	Review of New Project Proposals
9:30	Business Meeting

Report from S-10 Administrative Advisor	Doyle Chambers
Report from Animal Husbandry Research Division	P. A. Putnam
Committee Reports	
Old Business	
New Business	
Adjournment	

MINUTES OF S-10 EXECUTIVE COMMITTEE MEETING

Raleigh, North Carolina
June 8, 1969

The Executive Committee meeting was called to order by Dr. J. E. Legates at 8:30 p.m. in Room 170 of the College Inn Motor Lodge. The following members were present:

J. E. Legates, Chairman
Doyle Chambers, S-10 Administrative Advisor
Will Butts, Jr., S-10 Investigations Leader
J. W. Turner, Secretary

Dr. Legates discussed program changes needed by the absence of Dr. R. R. Shrode. Some discussion was directed to the time required to review new contributing project proposals. The need for standing committees was also discussed. Dr. Butts inquired about the need for regional publications and suggested that the S-10 crossbreeding bulletin needed revision. Dr. Legates asked about the exchange of data and the progress in accumulating individual feeding data for an efficiency study as discussed at the 1968 meetings. The consensus opinion among the committee was that publication committees were needed to survey the data available and to prepare the outlines for such possible publications. Dr. Legates agreed to bring these topics to the Technical Committee for their consideration.

Dr. Legates appointed Drs. Hill and McCormick to prepare and present resolutions.

Dr. Butts informed the committee that the W-1 project voted to disband. Dr. Chambers indicated that he had received correspondence concerning the 1970 joint meeting of S-10 and NC-1 at Clay Center, Nebraska.

The meeting was adjourned at 9:35 p.m.

Respectfully submitted,

J. W. Turner, Secretary

MINUTES OF S-10 TECHNICAL COMMITTEE MEETING

Raleigh, North Carolina
June 9 - 11, 1969

Chairman J. E. Legates called the meeting to order at 8:30 a.m. on June 9 in the Fitzpatrick Room of Polk Hall on the North Carolina State University campus. The following Technical Committee representatives were present:

Alabama - T. B. Patterson, Auburn University, Auburn
Arkansas - C. J. Brown, University of Arkansas, Fayetteville
Florida - M. Koger, University of Florida, Gainesville
Georgia - W. C. McCormick, Georgia Coastal Plains Exp. Sta., Tifton
Kentucky - Fred Thrift, University of Kentucky, Lexington
Louisiana - J. W. Turner, Louisiana State University, Baton Rouge
*Mississippi - Fay Hagan, Mississippi State University, State College
North Carolina - J. E. Legates, N. C. State University, Raleigh
**South Carolina - J. R. Hill, Jr., Clemson University, Clemson
Texas - T. C. Cartwright, Texas A&M University, College Station
Virginia - J. A. Gaines, Virginia Polytechnic Institute, Blacksburg

Other agencies and leaders:

Administrative Advisor - Doyle Chambers, L.S.U., Baton Rouge
AHRD-USDA - Paul A. Putnam, USDA, Beltsville, Maryland
Investigations Leader - Will T. Butts, Jr., AHRD, U. of Tenn., Knoxville

Others in attendance were:

H. A. Fitzhugh, Jr., Texas A&M University, College Station, Texas
Robert D. Scarth, University of Georgia, Athens, Georgia
Walter Neville, Georgia Experiment Station, Experiment, Georgia
W. T. Berry, Jr., American Hereford Association, Kansas City, Mo.
Robert C. McDaniel, Virginia Polytechnic Institute, Blacksburg, Va.
Hayes Gregory, T. G. S., Aurora, North Carolina
Emmett Dillard, N. C. State University, Raleigh, North Carolina
J. R. Crockett, Everglades Exp. Station, Belle Glade, Florida
E. R. Barrick, N. C. State University, Raleigh, North Carolina
I. D. Porterfield, N. C. State University, Raleigh, North Carolina
J. A. Vesely, N. C. State University, Raleigh, North Carolina
C. O. Tennant, Jr., N. C. State University, Raleigh, North Carolina
J. C. Williamson, Jr., N. C. State University, Raleigh, North Carolina
W. C. Burns, Brooksville Beef Cattle Research Sta., Brooksville, Florida
F. M. Peacock, University of Florida, Range Cattle Exp. Sta., Ona, Fla.
Bill Brown, University of Tennessee, Knoxville, Tennessee
Donald E. Franke, University of Florida, Gainesville, Florida
Larry V. Cundiff, USDA, ARS, AHRD, Lincoln, Nebraska

*Representing Dr. C. Lindley
**Representing Dr. W. C. Godley

Others in attendance were: (Continued)

O. W. Robison, North Carolina State University, Raleigh, N.C.
C. K. Vincent, Louisiana State University, Baton Rouge, Louisiana
David C. Meyerhoeffer, USDA, ARS, AHRD, Jeanerette, Louisiana
Bill Ahlschwede, N. C. State University, Raleigh, North Carolina
James R. Dickey, University of Florida, Gainesville, Florida
Rapael E. Rodinguez, University of Florida, Gainesville, Florida
Michael Tomaszewski, N. C. State University, Raleigh, N. C.
Benjamin Quijandria, N. C. State University, Raleigh, N. C.
H. A. Stewart, North Carolina State University, Raleigh, N.C.

Dr. Legates appointed Dr. James Riley Hill and Dr. W. C. McCormick to serve as members of the resolutions committee prior to the welcome by Dr. J. C. Williamson, Jr. The meeting progressed as outlined in the program. However, the Brooksville Station report by W. C. Burns was transferred to Tuesday morning due to time allotments and the reports from Louisiana were transferred to the afternoon program. Dr. R. R. Shrode was unable to attend the meetings; therefore, his presentation was omitted from the program. Dr. Don Franke outlined a proposed project for the Brooksville Station report. Dr. Hollis Chapman presented the Georgia Coastal Plains Experiment Station report.

The review of new project proposals included outlines from Kentucky, Tennessee and Florida. Dr. Thrift presented the revised plans for the Kentucky proposal. Dr. Will Butts, Jr. presented the Tennessee project proposal for discussion. Dr. Marvin Koger outlined plans for an additional project from Florida. Several comments concerning the merits of each proposal were made by various members of the Technical Committee.

The Business Meeting was called to order by Chairman Legates at 9:20 a.m. on June 11. Minutes of the 1968 Meetings were approved as printed in the 1967-1968 S-10 Report.

Dr. Koger moved that the Kentucky project proposal be approved by the Technical Committee. Dr. Patterson seconded the motion. The motion carried. Dr. McCormick moved for approval of the Tennessee project outline. Dr. Fred Thrift supported the motion by second. This motion passed by voice vote. Discussion of the Florida projects, as previously presented by Drs. Koger and Franke, followed. Because the Technical Committee did not have the opportunity to read and review outlines for both projects, Dr. Patterson moved that the Executive Committee be directed to grant approval on the revised outlines when presented to them at a later date. The second was made by Dr. Brown. The motion passed. Dr. Koger asked that each Technical Committee member send his review comments directly to him for the Brahman reproductive proposal. Dr. Don Franke indicated that he would prepare an outline for distribution to the Technical Committee. He also requested that if anyone had any research project they felt would merit consideration, he would be most happy to consider another project for the Brooksville cattle.

Dr. Legates discussed the reviewing of project proposals. He indicated that true joint cooperative efforts are needed; therefore, he stressed the importance that proposals be reviewed with due deliberation. He further commented on the effectiveness of regional research as reflected in regional publications. With reference to discussion and comments received during the Executive Committee meeting, Dr. Legates introduced the need for possible revision of the S-10 crossbreeding bulletin (Kincaid, 1962) and a possible publication related to feed efficiency. Dr. Brown stressed the need for a regional publication on breed differences. Dr. Patterson cited the need to study the data available and the outlines for such publications. Dr. Turner moved that two committees, both chaired by Dr. Butts, with each containing three committee members, be appointed for the coming year. Dr. Cartwright seconded the motion. The motion passed by voice vote. Dr. Gaines told the group he had some copies of the S-10 crossbreeding bulletin available for distribution. He also indicated that he was interested in the regional data available from individual and group feeding that could be used for analyses. Dr. Legates cited the need for a survey to determine the amount and extent of such data presently available. Dr. Turner moved that Dr. Gaines and Dr. Butts be appointed as a committee of two to survey the S-10 group and determine the amount and extent of pertinent data. Dr. Koger seconded the motion. The motion passed by voice vote.

Mr. Mike Tomaszewski presented materials on inbreeding programs to the meeting at the invitation of Dr. Legates. Mr. Tomaszewski indicated copies were available upon request.

Dr. Chambers, Administrative Advisor of S-10, addressed the group and centered his remarks on the future of beef breeding research. He cited the economic importance of livestock to the economy in the Southeast. Reference was also made to the long range projections made by the task force of joint USDA and State Administrators. State Administrators actually have projected more beef breeding research than specified by the Task Force. Dr. Chambers also indicated that the Federal-State Task Force was interested in simplified administration of regional research. With reference to regional work, Dr. Chambers stressed the need for cooperation and regional publication. He concluded his remarks by confirming the invitation for a joint meeting of each region at Clay Center, Nebraska, August 10 - 12, 1970.

Dr. Paul Putnam, AHRD, addressed the meeting and cited the funding problems associated with limited budgets. Research dollars require verification for continued support; therefore, he stressed that support cannot be taken for granted. He recommended that more short-term projects be considered. Dr. Putnam also informed the group on the administration of Clay Center. The Clay Center effort and the Beef Cattle Branch are organized separately under the direction of Dr. E. J. Warwick.

Dr. Legates called upon Dr. Butts for any comments he wished to direct to the group. Dr. Butts declined any additional comments citing his views presented during the course of the meetings.

Dr. Fred Thrift was elected to the Executive Committee by written ballot.

Dr. Koger moved that the S-10 Technical Committee accept the invitation to a joint meeting in Clay Center, Nebraska, for 1970. Dr. Patterson seconded the motion and it passed by voice vote.

Dr. Brown reviewed the need for discussion sessions that might generate new research ideas. Dr. Butts remarked on the need to get new ideas into projects rather than planning research around facilities. Dr. Cartwright expressed the need for sufficient time to present station reports and adequately discuss new areas of research at the 1970 meetings.

Resolutions were presented by Dr. McCormick and their acceptance was recommended. They were approved as read:

Report of S-10 Resolution Committee
June 1969

1. Be it resolved that the S-10 Technical Committee express their sincere appreciation to Dr. J. E. Legates and members of the Animal Science Department for their efforts in planning and conducting an excellent program and interesting tours and for their fine hospitality during the 1969 S-10 meeting. Be it further resolved that a copy of this resolution be sent to Mr. J. C. Williamson, Associate Director of the Experiment Stations and Dr. I. D. Porterfield, Head of the Animal Science Department.

2. Be it resolved that the S-10 Technical Committee express their deepest appreciation to Mr. J. I. Smith and co-workers, John Umstead Hospital, Butner, N. C. for the informative and well planned tour of the hospital farm and for the fine hospitality shown to the S-10 group on Monday evening. Be it further resolved that a copy of this resolution be sent to Mr. Leon Perkinson, Business Manager of the hospital.

3. Be it resolved that the S-10 Technical Committee express to Dr. W. T. Berry their greatest appreciation for his willingness to attend the S-10 meeting and for his thought provoking, forward thinking, well presented talk "We Must Lead to Survive." Be it further resolved that a copy of this resolution be sent to the Chairman of the Board of Directors of the American Hereford Association, Kansas City, Missouri.

4. Be it resolved that the Technical Committee express to Dr. C. Clark Cockerham its appreciation for his stimulating presentation to the S-10 group.

5. Be it resolved that the S-10 Technical Committee express to Dr. H. A. Stewart their sincere thanks for his continued interest and support of S-10.

6. Be it resolved that the S-10 Technical Committee whole heartedly express their sincere thanks to the North Carolina Cattlemen's Association for

the excellent dinner on Tuesday evening. Be it further resolved that a copy of this resolution be sent to Mr. Fred M. Teal, President, N. C. Cattlemen's Association.

Respectfully submitted,

W. C. McCormick
J. R. Hill

Dr. Patterson moved to adjourn at 11:10 a.m. The second was made by Dr. McCormick. The motion carried.

Members of the Executive Committee for next year are:

J. W. Turner, Chairman
R. R. Shrode, Secretary
Fred Thrift

Respectfully submitted,

J. W. Turner, Secretary

Genetics of the Growth Curve and Selection Implications

Presented to S-10 Technical Committee
June 1969

H. A. Fitzhugh, Jr.

In the DNA era the subject of genetics of growth might well imply consideration of metabolic pathways and associated enzymes. As the frontiers of molecular biology are advanced we can expect that "genetic engineering" will become a useful technique for animal breeders. However, these fascinating prospects are yet to be realized; hence, this discussion will be confined to the somewhat older (but, I hope, no less interesting) methods of quantitative genetics and their application to efficacious utilization of available genetic variation.

Types of Growth Data and Their Analysis

When the traits to be selected are determined, the next step is to describe the phenotype as accurately as possible. The multiple types of growth data which can be obtained are not all useful for the same purposes. Cock (1966) reviewed these various types of data and suggested methods of analyzing each type:

A. Static data - a set of measurements are obtained on a group of individuals which are uniform in age (chronological or physiological). Such data are primarily useful in studies of shape or form and provide essentially no information on growth. Examples of analysis of static data are the studies by Wright (1954) on chickens and Touchberry (1951) on dairy cows in which general, group and special size factors were identified. Oxnard (1969) presented an interesting canonical analysis of the relationship between shape and function of the scapula.

B. Cross-sectional data - although sets of measurements are obtained only once on each individual, the population itself is sampled for different individuals at a series of ages. Such data yield accurate information on the mean growth of the population to the extent that each subset of individuals is representative of the population. Analyses of cross-sectional data were reviewed by Seebeck (1968) with particular reference to studies of development of body composition. An example of cross-sectional data was the study by Pálsson and Verges (1952) on the development of carcass quality traits in sheep.

C. Longitudinal data - a complete set of measurements is obtained on each individual at every age. Only longitudinal data provide the information on individual variation in growth necessary for mass selection to be effective. Longitudinal data also retain the advantage of providing the more limited types of information available from cross-sectional or static data. Analysis of longitudinal data will be considered later.

D. Mixed longitudinal data - sets of measurements on some individuals are not available at every age; hence, this type of data is a mix of longitudinal and cross-sectional information. Examples include the weight-age curves of beef cows in the S-10 cow size study reported by Fitzhugh et al. (1967) and the various size-age curves for Hereford and Angus cattle described by Brown et al. (1956 a, b). Analysis of such data was discussed by Tanner (1951).

A collection of longitudinal data, even when confined to a single measure of body size, is often an embarrassment of riches. The information contained in the continuum of observations must be summarized in a set of manageable parameters. The biometrical literature includes many approaches to analysis of growth curves. Models for describing individual size-age curves include polynomials on age; alteration of the age scale so that growth is linear over age (Rao, 1958); and various equations which are nonlinear in the parameters, such as the monomolecular (Brody, 1945), the logistic (Nelder, 1961), the Gompertz (Laird, 1966), and von Bertalanffy curve (Fabens, 1965). A critique of these methods of describing size-age curves is a full subject in itself. However, two parameters necessary to most models for size-age curves are a measure of relative position, such as size at birth or maturity, and a measure of rate of growth or maturing, which largely determines the shape of the curve.

A major problem arising in the analysis of longitudinal data is that the correlations existing among observations over the experimental time period make it difficult to compare curves for different individuals. Fortunately, procedures have been recently reported by Grizzle and Allen (1968) for the estimation of parameters and tests of significance. Allen (1967) had earlier generalized their procedures to include nonlinear models. He also presented FORTRAN programs utilizing the algorithms he derived. Thus, it would appear that Seebeck's (1968) observation, "techniques for comparison of curves [for longitudinal data] ...have not been developed," is no longer appropriate.

Genetic Variation in Growth

The nature of variation (primarily genetic) in growth curves among species has been studied by Laird (1966) and Taylor (1965, 1968). Taylor found that the maturing index, k, (i.e. the rate at which asymptotic weight, A, is approached) was proportional at $A^{-.27}$ among mammalian species. The reciprocal of the maturing index, τ, used by Brody (1945) as the maturing-time interval, was thus proportional to $A^{0.27}$. Hence, different species tended to pass through equivalent maturity intervals for weight in time intervals proportional to $A^{0.27}$. The regression of log τ on log A for strains/species and sexes/strains yielded weighted average coefficients of 0.358 and 0.343, respectively, suggesting that the scaling factor within species was more closely proportional to the cube root of A. Aside from their value in describing the shape and position of growth curves, these results are pertinent to the design of experiments for measurement of traits, such as body composition and feed efficiency, which require knowledge of physiological age (Fitzhugh and Taylor, 1968; Seebeck, 1968).

The effects of major genes on animal growth, such as Creeper chickens and pygmy mice, have been described in the literature. The Snorter dwarf gene in cattle has had a major economic impact on the American cattle industry. Bovard and Hazel (1963) observed that the effect of the Snorter dwarf gene was primarily on the longitudinal growth of bones. Their results and those of Marlowe (1964) suggested that dwarf cattle matured for many traits considerably more rapidly than normal cattle. This effect of a major gene coincides with the results of selection experiments for relative length of the shank in chickens (Cock, 1966) and the cannon bone in sheep (Purser, 1966). Selection for increased relative length of long bones led to delayed maturation both in terms of sexual maturity and the approach to mature size. This difference in maturing rate is reminiscent of differences often found between ectomorphic and mesomorphic types.

A comprehensive review of the literature on genetic variation in growth and development of cattle has been presented by Taylor (1968 b).

Degree of Maturity and Genetic Dispersion

Taylor and Craig (1965, 1968) investigated the relationships between degree of maturity and estimates of genetic dispersion for 12 measures of linear body growth. Degree of maturity was defined as the proportion of mature size attained by a given body measurement at the time of observation. The data were collected on sixty pairs of monozygous and 60 pairs of dizygous twins at 90-day intervals from three months to two years of age.

Their first analysis led them to conclude that interage genetic correlations for a given linear measurement of body size depend on the amount of development which occured in the intervening interval, i.e. the change in degree of maturity. They expressed this conclusion in the formula.

$$E(r_{g\ ij}) = \exp(-\beta \Delta u_{ij})$$

where β measures the rate of decay of the genetic correlation between sizes at ages i and j which differ in degree of maturity by Δu_{ij}. The weighted least-squares estimate of β for their data was 0.77± .2; hence,

$$E(r_{g\ ij}) = \exp(-.77\Delta u_{ij}) \qquad (1)$$

For $\Delta u_{ij} < .2$, the simpler approximation

$$E(r_{g\ ij}) = 1 - .75\Delta u_{ij} \qquad (2)$$

should be adequate.

A result of (1) is that the genetic correlation for any age interval is the product of correlations for the set of continuous sub-intervals. For example, given three consecutive ages $i < j < k$

$$(r_g)_{ik} = (r_g)_{ij}\ (r_g)_{ik}. \qquad (3)$$

Consequently, all interage partial correlations will be zero except those between size at adjacent ages, e.g. while $(r_g)_{ij \cdot k}$ or $(r_g)_{jk.i}$ may be non-null, $(r_g)_{ik.j} = 0$.

Non-null interage genetic correlations imply that selection for size at one age will change size at other ages. As the magnitude of these correlations approaches unity, "genetic flexibility" in the mean growth curve sharply decreases. Using formula (3) and its described implications, Taylor and Craig (1965) stated that residual genetic variance at age j independent of that at adjacent ages i and k may be determined

$$\frac{(\sigma_g^2)_{j \cdot ik}}{(\sigma_g^2)_j} = \frac{1-(r_g)^2_{ij} \quad 1-(r_g)^2_{jk}}{1-(r_g)^2_{ik}} \qquad (4)$$

Even though (4) was determined from results for linear measures of size, this formula should be roughly correct for estimating genetic flexibility in mean weight-age curves. Estimates of genetic parameters on a minimum of 1608 Hereford females (Brinks et al., 1964) were used to obtain the results in table 1. The residual variation in weight at weaning, 12 months and 18 months independent of variation in weight at birth and maturity is sufficient to insure that restricted selection for these weights need not increase weight at birth or maturity. In contrast, the proportion of the genetic variation in 12-month weight independent of weights at weaning and 18 months was only 0.21. Part-whole relationships among these weights would account for much of these changes.

Partial correlations among premature weights independent of mature weight (table 2) indicate that those individuals which are most mature (measured as percent of mature weight attained) at birth are also more mature at later ages. This genetic relationship between maturity at 12 and 18 months was particularly high (r_g=0.83).

Nevertheless, the expected correlated increase in mature weight (and the accompanying increase in nutrient cost of maintenance) which results from selection for premature traits is considerable. The expected correlated responses for the data of Brinks et al. (1964) are given in table 3. The largest percent increase in mature weight results from direct selection for mature weight as would be expected; however, selection for premature weights would yield correlated responses in mature weight of 20-30 percent. Although selection for weight at weaning, 12 months or 18 months would apparently increase the rate of postnatal maturation (and, hence, alter the shape of the mean growth curve), these changes are negligible with respect to the increase in mature weight. Obviously, altering the shape of the mean growth curve will be facilitated by restricting increase in mature weight. A selection index to meet these objectives is considered in the next section.

Table 1. Genetic Variation in Weight of Beef Females.

Trait	$\hat{\sigma}g^2$	$\tilde{\sigma}g^2$*	$\tilde{\sigma}g^2$*/$\hat{\sigma}g^2$
Birth wt.	22	0	0
Wean. wt.	654	575	0.88
12m. wt.	868	686	0.79
18m. wt.	1740	940	0.54
Mature wt.(fall)	4251	0	0

*Independent of genetic variation in weight at birth and maturity.

Table 2. Interage Genetic Correlations for Weight of Beef Females.

	BW	WW	12	18	MW
Birth wt.		0.60	0.56	0.60	0.68
Wean. wt.	0.40*		0.71	0.75	0.51
12m. wt.	0.24	0.58		0.90	0.62
18m. wt.	0.20	0.64	0.83		0.74

*Correlations below diagonal are independent of mature weight.

Table 3. Expected Direct and Correlated Response to Selection for Weights or Scores Expressed as Percent of Mature Weight.[a]

	Selected trait						
Response for	BW	WW	Wean. score	12m	18m	18 mon. score	Mature wt.(fall)
Birth wt.	0.8	0.3	-.1	0.0	0.0	0.1	-.6
Wean. wt.	-.1	6.8	2.3	1.9	1.2	-.9	-4.7
12 m. wt.	-1.1	3.3	-3.7	5.7	2.9	0.2	-4.7
18 m. wt.	-1.6	4.9	-3.3	5.4	5.0	5.4	-5.5
% increase in mature wt.	24.4	19.4	2.6	22.9	30.4	4.2	43.9
Unselected means as % of mature wt.	6.9	35.5	-	43.3	65.6	-	1116 lb.

[a]Modified from Taylor (1968b); data from Brinks et al. (1964) for Hereford females, and represent the expected results for selection differential equal to ten times the phenotypic standard deviation (or 10-20 generations of selection).

Brinks et al. (1964) commented that selection for weaning or 18-month score would be relatively ineffective for increasing weight at those ages. However, it is interesting to note that selection for 18-month score would be even more effective in increasing degree of maturity at 18 months than would be selection for 18-month weight. This increase in early maturity due to selection on 18-month score apparently resulted from increased growth to 18 months coupled with the relatively slight increase (4.2%) in mature weight.

Results of four generations of selection for 8-week weight of chickens (table 4) reported by Siegel (1962, 1964) generally concurred with the predicted results for beef cattle. Selection for increased 8-week weight yielded positive correlated response in weights at 4, 24 and 38 weeks. Although selection did increase degree of maturity at 8 weeks by 5%, there was a 9.1% correlated increase in 38-week weight due to selection for 8-week weight.

Selection Index for Altering Shape of Growth Curve

Procedures for calculating coefficients for a selection index in which genetic change in one or more traits is restricted have been described by Tallis (1962). The formula for the vector of coefficients $\underline{b}$, is

$$\underline{b} = I - P^{-1}G_r'(G_rP^{-1}G_r')^{-1}G_rP^{-1}G\,\underline{a} + P^{-1}G_r'(G_rP^{-1}G_r')^{-1}\underline{k}$$

where

I - an identity matrix of order m = no. traits in index

P - phenotypic dispersion matrix, (m, m)

G - additive genetic dispersion matrix, (m, m)

G_r - obtained from G by deleting (m-r) rows associated with unrestricted traits, (r, m)

$\underline{a}$ - vector of m economic values

$\underline{k}$ - vector of r restrictions

Coefficients for three indices were calculated using estimates of G and P (table 5) reported by Brinks et al. (1964). These coefficients are given in table 6. No restrictions are placed on genetic change in any trait in indices 1 and 2. The first index gives equal economic emphasis to each trait, while the second index gives equal emphasis to weight at weaning, 12 and 18 months and zero emphasis to weights at birth and maturity. The third index imposes

Table 4. Response to Four Generations of Selection for Increased 8-Week Weight of Chickens (Females Only).[a]

Age	Means, kg.		%38 wk. wt.		Response	
	P_1	F_4	P_1	F_4	kg.	%38 wk. wt.
4 wk.	0.254	0.327	8.1	9.6	0.073	1.5
8 wk.	0.715	0.951	22.8	27.8	0.236	5.0
24 wk.	2.286	2.717	72.9	79.4	0.431	6.5
38 wk.	3.134	3.420	100.0	100.0	0.286	(9.1)

[a]Data from Siegel (1962, 1963)

Table 5. Phenotypic and Genetic Statistics[a] (Brinks et al., 1964).

Trait	Mean, lb.	BW	WW	12m	18m	MW
Birth wt.	77	22/59	73	78	118	209
Wean. wt.	396	123	654/1521	535	800	847
12-mon. wt.	483	149	1310	868/2116	1106	1186
18-mon. wt.	732	195	1519	2225	1740/3481	2004
Mature wt.	1116	232	1509	2255	3400	4251/7396

[a]Genetic covariances above diagonal; phenotypic covariances below diagonal; genetic variance/phenotypic variance on diagonal.

Table 6. Coefficients for Indices[a]

Trait	Index 1[b]	Index 2[c]	Index 3[d]
BW	0.46	0.22	0.08
WW	0.28	-.23	-.05
12m	0.07	0.29	0.55
18m	0.98	1.00	0.99
MW	1.00	0.18	-1.00

[a]Coefficients multiplied by phenotypic standard deviations and expressed relative to largest standardized coefficient.
[b]a = (11111); no restrictions
[c]a = (01110); no restrictions
[d]a = (01110); k = (+23,0), for birth wt., mature wt.

the restrictions that mean birth weight $\leq$ 100 pounds and mean weight at maturity not increase. These coefficients were than multiplied by the standard deviation for each respective trait and divided by the standardized coefficient with the largest absolute value in order to facilitate comparison of the relative emphasis given each trait.

Summary and Conclusions

1) Extreme care should be taken to collect the type of data best suited to the experimental objectives and that the appropriate method of analysis be employed. Longitudinal data are required for individual selection.

2) The mean growth curve can be basically defined by two parameters

a) A measure of location
b) A measure of growth rate or rate of maturing which determines the shape of the curve

Rate of maturing is apparently proportional to some power of mature size. This power is in the range of -.27 to -.33.

3) Selection for measures of premature size also increase mature size; however, some of the genetic variation in premature size is independent of mature size. The rate of maturing must be changed to alter the shape of the growth curve and major increases in rate of maturing require restricting increase in mature size.

4) A selection index can be calculated with the objectives of increasing weaning, 12-month and 18-month weight without limit while restricting change in mean weight at birth and maturity.

Should we then conclude that efforts be increased to change the shape of the mean growth curve of a given population? As researchers we would all be interested in the direct and correlated responses to a selection scheme with this objective. However, as animal breeders with responsibilities to the beef industry, can we advocate this program? I think not. Rather than commit our efforts to such a long term selection program, these efforts could be more effectively spent in characterizing breeds and lines which already differ in their "genetic growth curves." Combinations of breeds or lines should be chosen for their complementarity with the objective of improving the economic efficiency of beef production.

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Breed Associations Must Lead

by

W. T. Berry, Jr.

I am both honored and privileged to be your speaker this evening. Honored in being invited, and privileged in being able to choose my own subject. Although I have been away from academic work for nearly nine years, I have tried to maintain a close liaison and this workshop has been a very pleasant experience for me to renew old acquaintances, make new acquaintances, and sit in on your sessions.

I want to share with you some of my views on the beef business and relate them to: (1) registered Herefords and our Association; and, (2) the general field of research and your individual areas of interest. Let's start by talking about the end product - BEEF.

In the next decade, we will see an increasing demand for grain fed beef of what we now call choice quality. This increase in demand will be world-wide. There will be increased fabrication of the beef carcass, with new techniques in cutting, packaging, freezing, sealing, and convenience considerations for the consumer. All of this will emphasize the need for quality, and uniformity in size, shape and weight. There will be regional variations but I believe the steer for the next decade must gain rapidly and efficiently; will weigh about 1,100 pounds when slaughtered at an average age of 15 months; and, the carcass must grade choice and have high cutability. The packers say that they can save approximately 20 percent in labor costs by simply handling larger carcasses, weighing 650 to 725 pounds, instead of the lighter weight carcasses. This criteria in itself will have a lot to do with establishing the standard 1,100 pound finished steer.

There is a growing interest in feeding bulls for slaughter, but we will not see this practice increase very rapidly. Present standards will have to be changed and the need for regular eating satisfaction makes the retailer rather cautious about going to bull beef unless adequate research and experience proves that he will not sacrifice quality and lose customers. I am told that the government graders now can accurately identify staggy carcasses 90 percent of the time if they are 16 months of age or older, but in the case of carcasses of 12 months of age there is more difficulty in distinguishing between steer and bull carcasses.

The breed associations' principal duties are to record and transfer cattle and to maintain the purity of the breed, but the responsibilities are growing to include programs in performance testing, identification of genetically superior seedstock, and promotion of the product. The American Hereford Association's TPR Feedlot & Carcass and Cow-Calf programs are our way of leading Hereford breeders in what we think is a simplified but highly effective breed improvement program. Other breed associations have similar programs.

The four features of the AHA Carcass program are: (1) quality grade; (2) cutability; (3) weight-per-day-of-age; and, (4) efficiency. Thus far, in our program we have tested over 5,000 steers representing over 500 sires, and 25 percent of those tested have qualified for Register of Merit. This tells us our standards are tough but that the best steers can meet the test.

After we identify the best in our breed, we encourage showing because we want them to be paraded to acquaint the commercial industry and our registered breeders with what these cattle look like. It is one thing to identify the sires that are producing superior performing steers. It is still another thing to help set visual standards by showing the half sibs in the breeding classes. Combining the two is the best way we know of helping the breeders establish visual standards and visual standards still have a great deal to do with arriving at value in breeding or in marketing.

Your part in this is to continue your efforts in the research areas of carcass evaluation. We need to know more about marbling and eating satisfaction to guide us in grading standards. I hope we don't go so far in emphasizing cutability that we lose quality and reduce popularity and consumption of beef.

I would like to share with you some thoughts on plans to revise steer shows. Some will question this statement, but I believe in judging steer shows there has been a tendency to over-emphasize freedom from fat and high cutability and, likewise, a tendency to ignore doing ability, growth rate, and efficiency. As a result, we find at the top of the class thin rind steers with high cutability that sometimes do not even grade choice but may be six months older than the young, fresh, good doing steers standing down the line. The breed associations have recommended to Show and Fair Managers to set a 950 pound minimum weight on slaughter classes. This would remove the difficulty that judges have in sometimes now having to pick an 800 pound steer as champion. These are not the kind that make money in the feedlot, nor are they ever killed at that weight in a typical feedlot operation. We have also recommended that the rules read that a steer must have all of its temporary incisors with no permanent incisors in sight. This will encourage full feeding to demonstrate rapid growth. It will also discourage the use of muzzles to hold steers at constant weight to qualify for shows. We have also recommended that the top animals in each class be slaughtered to make up the carcass show, and do away with separate carcass shows.

At our Type Conference June 23 and 24, we are going to thoroughly cover body type and size. We have selected feeder calves of five body types and placed them on feed. The carcass information, as well as live examples of each type, will be displayed. It is our feeling that the present feeder calf grading system is inadequate and needs to be refined to assist in a more orderly and precise marketing of feeder calves. We are anticipating at the Conference we will recommend there should also be a description of the animal's condition and body type, along with the present grade designations.

We are observing many more commercial cowmen feeding their own cattle in custom feedlots. I believe this is the result of superior heavy weaning weights being discounted at selling time and, consequently, the cowmen are now maintaining ownership of these good calves and consigning them to custom feedlots for eventual sale directly to the packer. This form of integration will continue to increase.

Commercial cow-calf operators must depend upon the registered seedstock producer for genetic improvement. They don't have time to performance test their herds nor can they take chances on unknown seedstock. If our breeders cannot supply a reliable supply of range bulls, the commercial man will produce his own or find one of his neighbors in the commercial business who will do so.

It requires 1.75 million bulls annually to breed the nation's cow herd. There is a need for an additional 450,000 bulls annually to take the place of those bulls phased out. Records show that there are about 1,000,000 Hereford bulls used in breeding the majority of the 36 million beef cows in the United States. We accept the challenge to lead our registered breeders in the production of superior range bulls and feel that our programs (TPR) assist the registered breeders in meeting this challenge. We also know that supplying bull power is really our only business.

The role of our Association is to make the certificate of registration worth more so that the commercial industry will recognize its value. If we cannot add something extra to a registered animal's value then we are not doing our job. The newly-created performance certificate may require five years of planning and developing before it actually becomes a reality. However, we are at this time gathering information on nearly 100,000 registered Hereford cows so that when we initiate the certificate we will have the data that will make the certificate possible.

As I mentioned earlier, our TPR Cow program emphasizes reproduction, weaning weights, and post-weaning growth. Every breeder in our program must enroll and account for every cow in his herd. We also allow for considerable flexibility in breeders selecting the best age to get yearling heifer weights - either at 12, 15 or 18 months of age, depending upon the environment in which they are being grown out.

Reproductive performance has more to do with profits than any other single trait. Our program requires an annual accounting for every cow. She must have a calf, or some explanation given.

You, as researchers, should continue to work on fertility and reproduction because it is so important. On such subjects as super-ovulation, multiple births, ova transplants, double muscling, estrus control, and artificial insemination, I do hope that your news releases covering the research reports will keep these subjects in their proper perspective. Some cattlemen accept the farm paper reports at face value without carefully and cautiously examining all of the facts.

The greatest value in crossbreeding is in the improved reproductive performance and livability of the calf. Beyond that, there is little hybrid vigor advantage in the other traits. The increase in reproductive performance is justification enough in certain programs and certain regions; however, I do think that crossbreeding has been oversold by some people. The added cost, added problems, the need for better management and long-range planning, and the disadvantages in selecting and keeping replacement females should always be explained at the same time that the advantages are mentioned. Several breed associations, including the American Hereford Association, are advertising and advocating crossbreeding and, in our case, we are doing our best to educate cattlemen with the advantages of using Hereford bulls because of their all-around reliability. There will be some use of two-way and triple crossing with three breeds; however, I feel there will be more specialty production than is now anticipated. For example, I believe that there will be a lot of people remain with a one-breed program to simply supply high performing, straight bred replacement females. Likewise, there will be many using straight bred females and registered bulls of a different breed to produce FI heifers for sale. They will not retain any of them, but will use them as their cash product. There are really many advantages to this approach.

There are many outside forces which are making beef production more difficult. You, as researchers and educators, should be aware of and become involved in these matters. You should voice your opinion on these matters to your respective state and U. S. congressmen.

The huge land retirement plans and programs now under consideration could, again, bring a surplus beef supply and cause a chaotic beef price situation. Any land retirement plans designed to save approximately three billion dollars in cash crop subsidies, should be very gradual and not be done at the expense of the beef industry.

The proposed revisions in the present income tax law seems to be aimed at preventing the deduction of farm losses against income from outside of agriculture. We all know how difficult it is to start a livestock operation and start-up losses occur even in the most well-organized and best managed operations. A lot of research funds for agriculture have come from outside sources. If the tax laws dry up this potential source of funds, it seems to me we have severely handicapped agriculture in its competition with other industries.

In closing, I wish to express my sincere appreciation for the invitation to attend your annual workship and for this opportunity of informally visiting with you about some of the responsibilities of breed associations to the beef industry.

TABLE 1. Cattle Inventory and Percent Used in S-10 Contributing Projects July 1, 1969

State	Cows two years and over	Yearling heifers	Bulls and steers under one yr.	Heifers under one yr.	Bulls over one yr.	Steers over one yr.	Total no.	Percent used
Alabama	350	106	139	138	18	-	751	100
Arkansas	413	69	81	82	33	17	695	100
Florida	3310	1099	1165	1166	281	-	7021	92
Georgia	671	255	296	282	31	56	1591	96
Kentucky	184	45	62	83	18	-	392	100
Louisiana	328	35	62	84	28	-	537	100
Mississippi	169	40	68	58	16	39	390	100
North Carolina	204	68	78	75	18	-	443	100
South Carolina	171	42	59	60	22	-	354	100
Tennessee	260	55	93	84	10	-	502	100
Texas	424	107	-	-	48	37	616	100
Virginia	____	____	____	____	____	____	____	
Subtotal	6484	1921	2103	2112	523	149	13292	
Federal-State Cooperative Station:								
Brooksville, Florida	443	102	163	144	134	-	986	100
Jeanerette, Louisiana	315	73	81	96	45	-	610	100
Front Royal, Virginia	449	77	182	156	40	-	904	100
Subtotal	1207	252	426	396	219	-	2500	
Total	7691	2173	2529	2508	742	149	15792	

TABLE 2. Numbers of Animals Performance Tested and Slaughtered from S-10 Contributing Project in 1968-69

State	Performance tested			Slaughtered		
	Bulls	Heifers	Steers	Bulls	Heifers	Steers
Alabama	54	102	61	-	-	61
Arkansas	74	60	-	34	-	-
Florida	123	698	161	-	-	162
Georgia	62	156	56	9	18	49
Kentucky	69	78	-	65	-	-
Louisiana	-	-	117	-	-	110
Mississippi	-	-	41	-	-	41
North Carolina	61	68	-	43	-	-
South Carolina	18	55	45	10	13	45
Tennessee	106	117	-	67	-	-
Texas	90	93	24	9	-	23
Virginia						
Subtotal	657	1427	505	237	31	491
Brooksville, Florida	107	102	-	-	-	-
Jeanerette, Louisiana	102	89	-	64	-	-
Front Royal, Virginia	65	135	-	-	-	-
Subtotal	274	326	-	64	-	-
Total	931	1753	505	301	31	491

TABLE 3. Funds Expended on Beef Cattle Breeding Research in S-10 Herds During the Fiscal Year Ending June 30, 1969

State	Regional Research Funds	AHRD Funds	State-Controlled Funds	Income from Cattle
Alabama	25,498.00	- 0 -	47,000.00	55,746.28
Arkansas	16,000.00	- 0 -	60,000.00	50,000.00
Florida	- 0 -	- 0 -	80,000.00	78,000.00
Georgia	9,000.00	- 0 -	21,057.00	29,660.00
Kentucky	33,561.80	2,665.00	8,056.47	17,710.87
Louisiana	26,655.00	- 0 -	70,599.00	45,342.86
Mississippi	14,830.00	- 0 -	18,000.00	14,000.00
North Carolina				
South Carolina	11,489.00	- 0 -	13,474.27	34,500.00
Tennessee	10,000.00	10,100.00	50,000.00	40,000.00
Texas	14,174.97	25,000.00	250,392.32	266,049.60
Virginia				
Brooksville, Florida	- 0 -	66,463.00	97,190.69	71,186.04
Jeanerette, Louisiana	- 0 -	54,613.00	108,755.00*	50,253.77
Front Royal, Virginia				

*Includes $5,250 cooperative agreement funds expended for wages through State.

STATE REPORTS

AUBURN UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Hatch 219 (S-10)

The effect of environment, genetic-environmental interaction and heterosis on performance of beef cattle.

II. OBJECTIVES:

To evaluate the effect of environment and genetic progress under phenotypic selection.

To determine the effectiveness of selection for total performance in beef cattle.

To determine the influence of heterosis on rate of gain carcass quality and cow performance.

III. PERSONNEL:

T. B. Patterson and G. B. Meadows

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The purebred Angus and Hereford herds have been divided into similar groups based on ancestry and previous record. Line I Angus and Hereford herds have been designated as the high nutritional groups while Line II Angus and Hereford herds have been designated as the low nutritional herds. Selection by index for replacements will be on a within group basis.

The crossbreeding study is in the final phase with the last group of steers in the feedlot.

2. Research results.

Data for the second full year have been completed through postweaning performance. These data are summarized in table 1. Differences in adjusted weaning weight for both breed and level of nutrition were less than those for the 1966-67 calves. With respect to nutritional levels, the small differences in weaning weight along with some compensatory gain resulted in little difference in W/DA at the end of test. Since numbers are small and these data cover one calf crop, no further inferences will be made.

Four bulls, two Angus and two Hereford, were selected by index as herd sires. In addition, 39 Angus and 22 Hereford heifers were selected by index as replacements. The bulls will be bred to a limited number of females the first year. The heifers are bred to calve as two year olds.

The last group of crossbred calves have been weaned. Postweaning performance test has been completed for the heifer calves. The steer calves are in the feed lot and they are slaughtered as they reach 1000 lbs. shrunk weight. These data will not be completed until the latter part of 1969. These data will be analyzed and published.

The calves on the higher nutritional level gained faster from birth to weaning (46 lbs.). Postweaning, the low nutrition group gained faster (2.76 vs. 2.55 for the bulls and 1.54 vs. 1.42 for the heifers). Contrary to last year, weight per day of age at the end of test was approximately the same for the bull calves.

Table 1. Summary of 1967-68 Calves - Birth to End of Test

Breed	Angus				Hereford			
Sex	Bulls		Heifers		Bulls		Heifers	
Nutritional Group	I	II	I	II	I	II	I	II
Number	14	10	18	21	18	14	11	14
Avg. birth wt., lbs.	63	65	60	61	73	74	69	70
Avg. adj. weaned wt., lbs.	526	508	519	454	515	481	535	481
Avg. ADG on test, lbs.	2.57	2.87	1.42	1.62	2.53	2.68	1.43	1.43
Avg. W/DA and test, lbs.	2.31	2.36	1.63	1.54	2.27	2.22	1.67	1.53
Avg. final CS[1]	13.2	13.6	13.1	13.0	13.5	12.8	12.7	12.1
Avg. final finish sc.[2]	4.6	4.5	5.6	4.9	4.6	4.9	5.3	4.1

[1] 12 = Low choice; 13 = choice
[2] 4 = Medium minus; 5 = medium; 6 = medium plus

V. FUTURE PLANS:

The project will be continued on the present basis.

VI. PUBLICATIONS DURING THE YEAR:

Summary Beef Cattle Performance Test

VII. PUBLICATIONS PLANNED:

None

Submitted by: Troy B. Patterson

I. PROJECT: Animal Science 4-016

A comparison of crossbreeding and within breed selection on beef cattle production in the Black Belt Area of Alabama.

II. OBJECTIVES:

To evaluate the significance of hybrid vigor in various crosses of beef cattle with regard to production of slaughter calves, stocker or feeder steers and slaughter steers.

To determine the effect of heterosis on mothering ability, adaptability and fertility.

III. PERSONNEL:

T. B. Patterson, L. A. Smith and Harold Grimes

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Under objective 1 the following procedure is being followed to obtain additional information on crossbreeding. Twenty-eight mature Hereford cows and 28 mature 1/2 Angus 1/2 Hereford cows will be used in this study. Each group of 28 cows will be divided into similar groups of 14 each based on age and previous record. The four groups will be bred to produce calves as follows:

Bulls	Cows		Breed composition of calves
	No.	Breed	
Hereford	14	Hereford	Hereford
Hereford	14	Angus 1/2 - 1/2 Hereford	3/4 Hereford - 1/4 Angus
Charolais	14	Hereford	1/2 Charolais - 1/2 Hereford
Charolais	14	1/2 Angus - 1/2 Hereford	1/4 Angus 1/4 Hereford 1/2 Angus

One Hereford bull and one Charolais bull will be used for two consecutive years. Groups of cows will be reversed by breed of bulls for the second year. At the end of the second season, all cows will be reallotted and two new bulls obtained. The above breeding procedure will be repeated.

All calves will be creepfed until pasture is available in the spring. Additional creep will be used only when pasture conditions are such that supplemental feeding becomes necessary to maintain normal growth.

Environmental differences between groups will be minimized by pasture rotation on a regular basis.

Weaning weights, slaughter and feeder grades will be recorded. An estimated market value will be obtained at weaning by an experienced local cattle buyer.

At weaning the steer calves will go directly to the feed lot where they will be fed by breed groups to an average shrunk weight of approximately 1000 pounds. The steers will be marketed by breeding groups as they reach the desired weight. Data collected will include feed lot gain, feed efficiency, complete slaughter data and a tenderness evaluation based on samples from a two inch rib section from the left side taken at the twelfth rib of each carcass.

2. Research results.

The first set of calves have been weaned and the steers fed out and slaughtered. The weaned data are included in table 1. The difference between the average weaning weight of Hereford and 3/4 Hereford calves is approximately the same as in previous years. The Charolais sired calves averaged 71 pounds heavier at weaning than did Hereford sired calves.

All steer calves performed well in the feed lot. These data are given in table 2. There is some indication of compensatory gain as the Hereford sired steers performed at a level superior to the preweaning period. The Charolais sired calves gained 2.63 pounds daily compared to 2.59 pounds for the Hereford sired calves. Feed efficiency was excellent for all groups.

Carcass data favored the Charolais sired steers, table 3. The Charolais sired steers had heavier carcasses, graded slightly higher, had less fat, more rib-eye per cwt. carcass and had better yield grades.

These data cover one year with small numbers. However, Charolais sired calves wean heavier, gain faster and produce better carcasses than Hereford sired calves.

Table 1. Summary 1967-68 Weaning Data
Black Belt Substation, Marion Junction

	Breeding of Calves			
	Hereford	3/4 Hereford 1/4 Angus	1/2 Charolais 1/2 Hereford	1/2 Charolais 1/4 Hereford 1/4 Angus
No. of calves	16	12	11	11
Avg. birth wt., lbs.	69	66	84	73
Avg. adj. weaning wt., lbs.[1]	545	574	621	636
Avg. feeder grades[2]	13.6	13.7	13.6	14.2
Avg. market value, dollars	140.76	151.74	156.57	164.18

[1] 250 days weaning, mature dam, steer equivalent
[2] 12 = Low choice; 13 = choice

Table 2. Summary 1967-68 Feed Lot Data for Steers
Black Belt Substation, Marion Junction

	Breeding of Steers			
	Hereford	3/4 Hereford 1/4 Angus	1/2 Charolais 1/2 Hereford	1/2 Charolais 1/4 Hereford 1/4 Angus
No. of steers	5	4	6	6
Avg. days on feed	144	160	169	147
Avg. unadj. wean. wt., lbs.	606	634	658	692
Avg. final wt., lbs.	964	1071	1097	1083
Avg. daily gain, lbs.	2.48	2.73	2.60	2.66
Avg. W/DA at slaughter, lbs.	2.39	2.56	2.58	2.66
Avg. feed/cwt. gain[1]	928	909	896	986
Avg. final grade, live[2]	13.0	14.2	12.2	12.5

[1] 35% roughage, 65% concentrate
[2] 12 = Low choice; 13 = choice; 14 = high choice

Table 3. Summary 1967-68 Carcass Data
Black Belt Substation, Marion Junction

	Breeding of Steers			
	Hereford	3/4 Hereford 1/4 Angus	1/2 Charolais 1/2 Hereford	1/2 Charolais 1/4 Angus 1/4 Hereford
Avg. chilled carc. wt., lbs.	538.4	606.2	643.1	633.4
Avg. dressing % (hot carc.)	59.9	60.8	62.9	62.8
Avg. carc. grade, federal[1]	11.2	12.0	11.7	12.2
Avg. rib-eye/cwt. carc., sq.in.	2.00	2.04	2.35	2.34
Avg. back fat, inches	0.46	0.58	0.37	0.42
Avg. yield grade	3.1	3.4	2.4	2.6

[1] 11 = High good; 12 = low choice

V. FUTURE PLANS:

Continue as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Crossbreeding Beef Cattle in the Black Belt Area of Alabama.

I. PROJECT: Animal Science 4-017

The effects of breed and breed crosses on milk production and on other production factors in a grade beef herd.

II. OBJECTIVES:

To determine the effect of Brown Swiss, Holstein and Charolais breeding on (a) milk production, (b) weaning weights and grades, (c) feedlot performance, and (d) carcass desirability.

III. PERSONNEL:

T. B. Patterson, W. W. Cotney and R. A. Moore

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Seventy-five grade Hereford cows were divided into similar groups of 25 each on the basis of age, breeding, and previous production record. They were bred to Hereford (control), Brown Swiss, and Charolais bulls. The bulls have been changed each year and the cows redivided to minimize sampling differences. In addition, grade Holstein cows have been bred to the Hereford control bulls to produce a fourth group of calves.

The females thus produced will serve as foundation stock for the project. The foundation females will be backcrossed to Hereford bulls selected from known high milking dams. Milk production, weaning weights, and grades will be determined for each generation (three generations of backcrosses). In addition, postweaning performance and carcass information will be obtained.

2. Research results.

The first phase of this study has been completed. Three groups of calves have been carried through the weaning and pasture periods and three groups of steers have been finished in the feed lot and carcass data obtained. All physically sound heifers from the four breeding groups have been retained as replacement females for the second phase.

Data for the first calf crop of the second phase through weaning have been completed. These data for the purpose of preliminary reporting have been adjusted to the average for all calves. These data are presented in table 1.

Calves out of one-half Charolais, one-half Brown Swiss and one-half Holstein cows weaned calves that were 66, 75 and 101 pounds heavier, respectively, than were calved out of straight Hereford cows. No significant differences in slaughter grades between breeds were noted.

Table 1. Summary - 1967-68 Weaning Data
Upper Coastal Plain Substation, Winfield, Alabama

	Breeding of Cows[1]			
	Hereford	1/2 Charolais 1/2 Hereford	1/2 Brown S. 1/2 Hereford	1/2 Holstein 1/2 Hereford
No. of calves	13	13	10	15
Avg. birth wt., lbs.	64	63	61	67
Avg. adj. weaning wt., lbs.[2]	467	533	542	568
Avg. feeder grades[3]	12.5	13.1	12.3	12.2

[1]All calves sired by Hereford bulls.
[2]Adjusted to 250 days, average sex and average age to dam.
[3] 12 = Low choice; 13 = choice

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

A popular type report on the first phase of this study.

Submitted by: Troy B. Patterson

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Alabama

Location		Auburn	Auburn	Auburn	Auburn	
Breed of sire		Angus	Angus	Hereford	Hereford	
Breed of dam		Angus	Angus	Hereford	Hereford	
Line or group[1]		I	II	I	II	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1969	Cows 2 years and over	47	47	44	50	
	Yearling heifers	18	21	11	11	
	Bulls and steers under 1 year	16	19	16	18	
	Heifers under 1 year	23	21	16	20	
	Bulls over 1 year	3	3	3	3	
	Steers over 1 year	0	0	0	0	
Repro. perf.	Percent pregnant[2]	80.4	80.4	61.8	75.9	
	Calf survival percent[3]	95.1	92.7	94.1	92.7	
Wean. perf.	Adj. ADG[4]	1.84	1.66	1.81	1.63	
	Av. type sc.[5]	13.0	13.0	13.1	12.4	
Postweaning performance	No. of bulls	14	10	17	13	
	No. of heifers	22	28	13	15	
	No. of steers	3	3	2	5	
Slaughtered	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	3	3	2	5	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: adjusted to mature cow, steer equivalent.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Alabama

Location		BBSS Marion Jct.	BBSS Marion Jct.	BBSS Marion Jct.	BBSS Marion Jct.	
Breed of sire		Hereford	Hereford	Charolais	Charolais	
Breed of dam		Hereford	Angus-Hereford	Hereford	Angus-Hereford	
Line or group[1]		Crossbred	Crossbred	Crossbred	Crossbred	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1969	Cows 2 years and over	13	17	13	14	
	Yearling heifers	8	6	5	5	
	Bulls and steers under 1 year	6	7	6	6	
	Heifers under 1 year	5	14	3	4	
	Bulls over 1 year	0	0	0	0	
	Steers over 1 year	0	0	0	0	
Repro. perf.	Percent pregnant[2]	88.89	93.33	85.71	64.70	
	Calf survival percent[3]	100	100	91.67	100	
Wean. perf.	Adj. ADG[4]	1.87	1.99	2.11	2.21	
	Av. type sc.[5]	13.6	13.7	13.6	14.2	
Postweaning performance	No. of bulls	0	0	0	0	
	No. of heifers	8	6	5	5	
	No. of steers	5	4	6	6	
Slaughtered	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	5	4	6	6	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: mature dam steer equivalent

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Alabama

Location		UCPSS Winfield	UCPSS Winfield	UCPSS Winfield	UCPSS Winfield	
Breed of sire		Hereford	Hereford	Hereford	Hereford	
Breed of dam		Hereford	1/2 Hereford 1/2 Charo.	1/2 Herefd. 1/2 B.Swiss	1/2 Herefd. 1/2 Holstein	
Line or group[1]		grades	crosses	crosses	crosses	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1969	Cows 2 years and over	21	29	27	28	
	Yearling heifers	3	5	5	8	
	Bulls and steers under 1 year	10	12	11	12	
	Heifers under 1 year	9	9	7	7	
	Bulls over 1 year	6				
	Steers over 1 year	0	0	0	0	
Repro. perf.	Percent pregnant[2]	77.8	87.5	100	87.5	
	Calf survival percent[3]	90.5	100	100	90.5	
Wean. perf.	Adj. ADG[4]	1.61	1.88	1.92	2.00	
	Av. type sc.[5]	12.5	13.1	12.3	12.2	
Postweaning performance	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	9	7	5	6	
Slaughtered	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	9	7	5	6	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF ARKANSAS
Agricultural Experiment Station
Fayetteville, Arkansas

I. PROJECT: Hatch 170

Evaluation of performance records of beef cattle.

II. OBJECTIVES:

Continue to develop practical but adequate methods for identifying, evaluating and propagating the genetic potential for the production of beef.

III. PERSONNEL:

C. J. Brown, R. S. Honea and Lans O. Brown

IV. ACCOMPLISHMENTS DURING THE YEAR:

Purebred matings and crossbred matings as indicated by the inventory were made. Data on postweaning performance and carcass merit of purebred bulls were taken as indicated. The first calf crop from the crossbred matings are currently on feed. A companion project under which 160 bulls from cooperating breeders were individually fed at three locations was continued.

A series of analyses were completed during the year. In the first from sire components of variance and covariance heritability and phenotypic, genetic, and environmental correlations were estimated for twelve traits indicating development during four growth periods. These estimates obtained from 299 Hereford and 319 Angus bulls individually fed on performance test between 1955 and 1965 are presented in figure 1 and table 1. These estimates were obtained on a within-breed within-test basis and are based on 84 degrees of freedom for sires. Heritability estimates of weight or gain during the transition period were slightly lower than estimates either earlier or later in the life of the animal. Genetic correlations among weights in different periods of growth were, in general, high positive values. The genetic correlations between daily gain during the suckling period and daily gain during the postweaning feeding period were .27. There were low phenotypic and relatively high genetic correlations between type scores and performance traits.

In the second analysis a least squares analysis of three years data from the Pinetree Land Use Project was completed to establish some of the factors influencing calf weight, grade and condition at this location. This analysis was made to obtain correction factors for these traits at this station. The

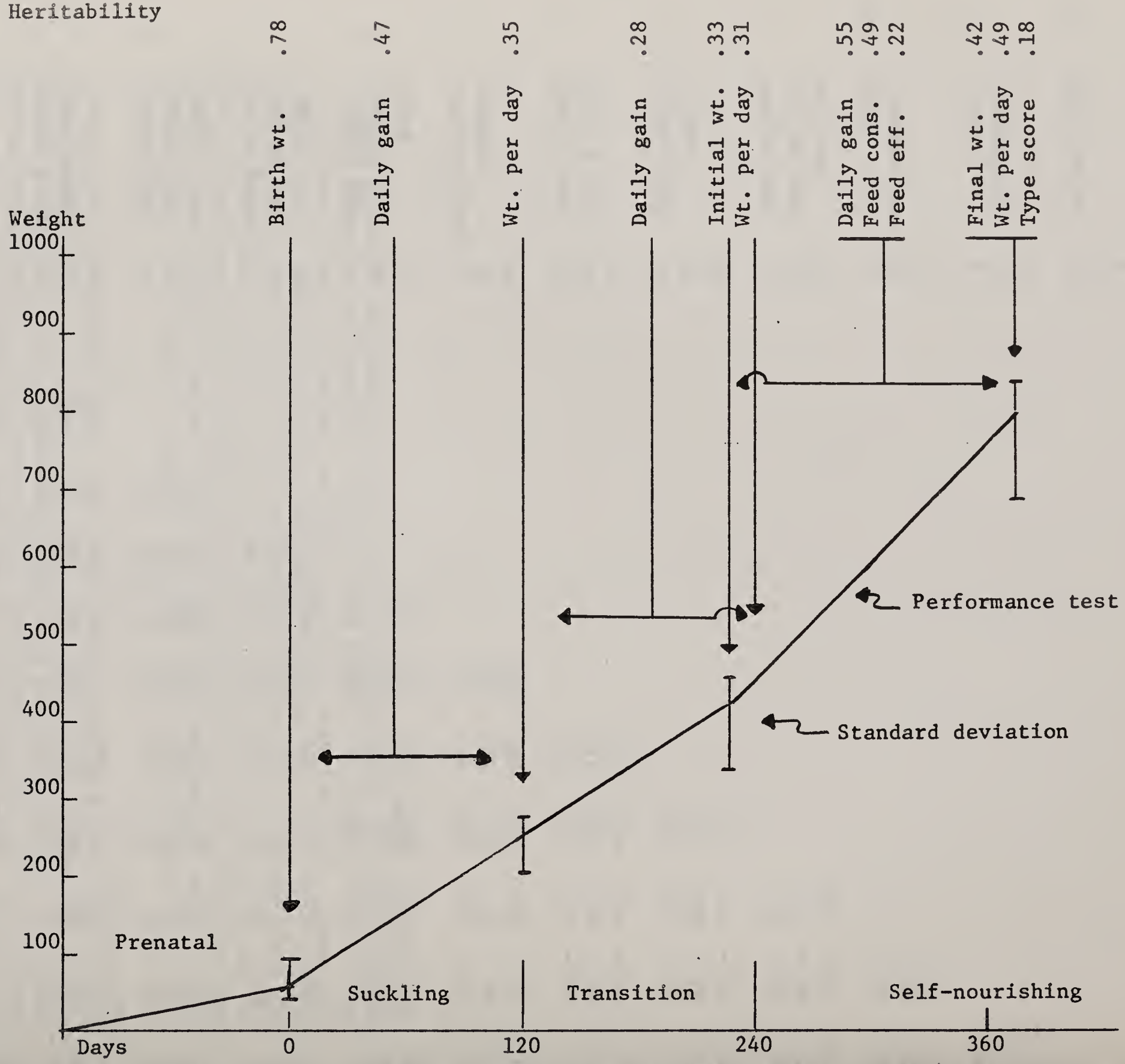

Figure 1. Growth Curve of a Beef Calf Showing Variability and Heritability at Different Points

Table 1. Correlations Among Performance Traits of Hereford and Angus Bulls from Combined Analysis

Variable Number			2	3	4	5	6	7	8	9	10	11	12
1	Birth weight	P	-.02	.24	-.02	.18	.03	.16	.13	.25	-.03	-.28	.07
		G	.14	.55	.29	.51	.76	.66	.67	.86	.53	-.38	-.02
		E	.02	.19	.18	.28	.11	-.37	-.12	-.23	-.06	.11	.07
2	Daily gain to 120 days	P		.90	.57	.58	.73	.18	.56	.50	.40	.16	-.01
		G		.99	.62	.61	.63	.27	.38	.44	.36	.34	.48
		E		.73	.52	.53	.60	.27	.60	.52	.45	.01	.06
3	Weight per day at 120 days	P			.54	.96	.71	.24	.58	.56	.38	.06	.18
		G			.64	.73	.72	.51	.76	.87	.62	-.24	.29
		E			.50	.52	.52	.78	.44	.39	.35	.12	.13
4	Daily gain 120 to 240 days	P				.96	.69	.13	.51	.60	.47	.28	.15
		G				.99	.41	.38	.48	.74	.43	-.13	.76
		E				.97	.84	.14	.70	.69	.54	.15	.11
5	Weight per day at 240 days	P					.70	.16	.54	.65	.43	.20	.15
		G					.45	.50	.60	.60	.54	-.16	.68
		E					.86	.12	.70	.68	.53	.15	.11
6	Initial test weight	P						.27	.79	.65	.61	.25	.10
		G						.28	.81	.53	.70	.10	.73
		E						.15	.81	.69	.59	.21	.13
7	Daily gain during test	P							.79	.76	.69	-.56	.23
		G							.77	.67	.73	-.63	.33
		E							.69	.74	.54	-.70	.32
8	Final test weight	P								.89	.82	-.20	.21
		G								.74	.88	-.35	.58
		E								.95	.79	-.23	.29
9	Weight per day at end of test	P									.74	-.24	.22
		G									.77	-.05	.57
		E									.67	-.46	.21
10	Feed consumption	P										.16	.16
		G										.02	.39
		E										.07	.22
11	Feed conversion	P											-.20
		G											-.04
		E											-.27
12	Type score	P											
		G											
		E											

least squares means for the fixed effects are presented in table 2. The partial regression coefficients for the continuous variables included are presented in table 3. All variables included in the model had a highly significant influence on weaning weight except the linear effects on calf age and cow weight. Influences on weaning grade of breed, herd, year, age of cow quadratic, age of calf linear and quadratic, and birth weight were highly significant. Influences on weaning condition scores of breed, herd, age of cow (both linear and quadratic), age of calf (both linear and quadratic), and birth weight were highly significant. The heavier weaning weights of calves from open cows and the unusually light weights of calves at 210 days suggested that the cow herds were producing under stress conditions. The nature of the stress factors are being investigated in management studies.

Tables 4, 5 and 6 present the analysis of four expressions of feed conversion. These expressions were TDN_A, adjusted for gain and mid-weight, $Gain_A$, gain adjusted for TDN consumption and mid-weight; $Ratio_A$, the ratio of gain to TDN adjusted for mid-weight; and Ratio, the unadjusted ratio of gain to TDN consumption. Heritability of gain adjusted for TDN and mid-weight was highest, .51 $\pm$ .20, of the four measures of feed efficiency. This is in agreement with an earlier study of these four measures of efficiency by Koch et al. (1963) (J. Animal Sci. 22:486). Phenotypic variances were slightly smaller and correlations among the four measures differed from this earlier study.

Table 2. Least Squares Means for Weaning Variables

Items	Number	Weaning weight (257 days)	Weaning grade	Weaning condition
Mean	623	432.9	12.2	4.2
Breed:				
AA	236	442.8	13.0	4.3
MA	63	452.7	12.0	4.3
HH	182	388.4	12.3	3.9
MH	142	447.6	11.5	4.2
Sex:				
Steers	304	440.7	12.1	4.2
Heifers	319	425.0	12.2	4.2
Herd:				
M	256	425.2	11.8	3.9
N	273	430.6	11.9	4.1
X	94	442.8	12.9	4.5
Year:				
1965	183	416.2	12.7	4.3
1966	188	446.8	11.9	4.1
1967	252	435.6	12.0	4.1
Parity:				
Pregnant	511	376.5	12.3	4.2
Open	112	489.3	12.1	4.1

Table 3. Partial Regression Coefficients (b-values) from Least Squares Analysis (continuous variables)

Items	Weaning weight	Weaning grade	Weaning condition
Age of cow (linear)	26.863	0.4604	0.2085
Age of cow (quadratic)	-1.681	-0.0281	-0.0120
Age of calf (linear)	-0.174	0.0668	0.0251
Age of calf (quadratic)	0.003	-0.0001	-0.00004
Weight of cow (linear)	-0.089	0.0002	-0.0019
Weight of cow (quadratic)	0.0001	-0.0000007	0.0000007
Birth weight	2.620	0.0214	0.0100

Table 4. Means and Standard Deviations of Traits of Performance-tested Bulls*

Traits	Angus		Hereford		Combined	
	Means	Std. Dev.	Means	Std. Dev.	Means	Std. Dev.
Age started on test	223	12	224	12	223	12
Beginning test weight	427	35	404	36	417	35
Mid-weight	605	42	586	44	597	43
TDN per day	12.5	1.0	11.5	0.8	12.1	0.9
TDN/ADG	5.3	0.4	4.9	0.3	5.1	0.4
ADG	2.4	0.2	2.4	0.2	2.4	0.2
ADG/TDN	0.19	0.01	0.21	0.01	0.20	0.01
Adjusted ADG	2.4	0.2	2.4	0.1	2.4	0.2
Adjusted TDN	12.5	0.8	11.5	0.7	12.1	0.7
Adjusted gain/TDN	0.19	0.00	0.21	0.00	0.20	0.00

*All data are in the form of pounds except for age started which is in days.

Table 5. Partial Regression Coefficients Used to Obtain Adjusted Values of Daily Gain and Daily TDN Consumption

Variables	Regression Coefficients		
	Angus	Hereford	Combined
	Regression of Gain on TDN		
TDN	0.1296**	0.1507**	0.1377**
Mid-weight	0.0010**	0.0004	0.0007**
	Regression of TDN on Gain		
Gain	1.5282**	1.4308**	1.5102**
Mid-weight	0.0128**	0.0111**	0.0120**

**P<.01

Table 6. Heritability Estimates and Standard Errors of Traits Studied on Performance Test and the Phenotypic Variance

Traits	Hereford	Angus	Combined
Gain on test	0.28 ± 0.28	0.49 ± 0.26	0.43 ± 0.19
TDN consumed	0.74 ± 0.37	0.42 ± 0.25	0.54 ± 0.21
TDN_A	0.30 ± 0.26	0.45 ± 0.29	0.42 ± 0.19
$Gain_A$	0.71 ± 0.36	0.38 ± 0.24	0.51 ± 0.20
$Ratio_A$	0.38 ± 0.30	0.35 ± 0.23	0.30 ± 0.18
Ratio	0.29 ± 0.28	0.51 ± 0.18	0.14 ± 0.05
	Phenotypic Variance		
Gain on test	0.0505858	0.0711912	0.0624728
TDN consumed	0.9873492	1.2850782	1.1546950
TDN_A	0.6213437	0.8868924	0.7740670
$Gain_A$	0.0277405	0.0349987	0.0318062
$Ratio_A$	0.0000037	0.0000002	0.0000017
Ratio	0.0002193	0.0002431	0.0002324

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Arkansas

Location		MS	MS	MS	MS	MS
Breed of sire		Angus	Hereford	PH	(SG,A,Ch,H)	(SG,A,Ch,H)
Breed of dam		Angus	Hereford	PH	Angus	Hereford
Line or group[1]		Purebred	Purebred	Purebred	Crossbred	Crossbred
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	186	72	69	47	39
	Yearling heifers	41	11	8	4	5
	Bulls and steers under 1 year	67			8	6
	Heifers under 1 year	56			13	13
	Bulls over 1 year	11	11	11	0	0
	Steers over 1 year	10	0	0	5	2
Repro. perf.	Percent pregnant[2]	83	91	86	70	70
	Calf survival percent[3]	91	91	97	92	78
Wean. perf.	Adj. ADG[4]	1.83	1.71	1.94		
	Av. type sc.[5]	12.7	12.5	12.4		
Postweaning performance	No. of bulls	39	19	16		
	No. of heifers	41	11	8		
	No. of steers	0	0	0		
Slaughtered	No. of bulls	18	9	7		
	No. of heifers	0	0	0		
	No. of steers	0	0	0		
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF FLORIDA
Agricultural Experiment Station
Gainesville, Florida

I. PROJECT: 627 (Revised)

Pasture programs and cattle breeding systems for beef production on flatwoods soils of Northcentral Florida.

II. OBJECTIVES:

To determine the relative cost of three pasture programs for beef production with a cow-calf operation.

To compare the effectiveness of four different breeding systems in improving the production of beef cattle.

To evaluate systems for growing heavy calves to market weight and grade.

III. PERSONNEL:

M. Koger, W. G. Blue, G. B. Killinger, J. M. Myers and R. E. L. Greene

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two hundred and ten females of breeding age were used during 1966-67 in evaluating four breeding programs which were initiated in 1957 with a foundation of Brahman-Native females:

1. Upgrading to British sire (Angus and Hereford)

2. Crisscrossing Angus and Hereford

3. Crisscrossing Angus and Brahman

4. Crisscrossing Hereford and Santa Gertrudis

Weaning data from the 1967 calf crop are presented in form S-10-1.

V. FUTURE PLANS:

Present procedures will be continued until blood composition becomes stable enough to evaluate the programs. The data from feeding steers produced in the four programs will be summarized for presentation.

VI. PUBLICATIONS DURING THE YEAR:

Field Day Report

VII. PUBLICATIONS PLANNED:

Station bulletin summarizing data from 1960-1964 in press.

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida

I. PROJECT: 922

Angus, Brangus and Angus x Brangus crossbreds for beef production in the Everglades area.

II. OBJECTIVES:

To compare the performance of straightbred Angus and Brangus cattle with rotation crosses of the two breeds for beef production in the Everglades area.

To develop a highly productive herd of cattle at the Glades Correctional Institution through selection based on production testing.

III. PERSONNEL:

J. R. Crockett, D. W. Beardsley and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

There were 1191 females of breeding age in the project. Blood composition has not stabilized to the point that performance of different breed groups can be evaluated with confidence.

V. FUTURE PLANS:

Increased selection pressure is to be initiated in order to speed up stabilization of blood composition of different breed groups.

VI. PUBLICATIONS:

None

VII. PUBLICATIONS PLANNED:

None

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida

I. PROJECT: 990

Breeding beef cattle for adaption to South Florida conditions.

II. OBJECTIVES:

To compare the performance of progeny of Angus, Brahman and Hereford cattle, and from three possible two-breed rotational crosses of these breeds for beef production in the South Florida area.

To develop through selection, Angus and Hereford cattle which will be adapted to South Florida conditions.

III. PERSONNEL:

J. R. Crockett, D. W. Beardsley and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

There were 419 females of breeding age in the project. Data from this project are shown in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined. Study grazing habits and forage intake of the different breed groups.

VI. PUBLICATIONS:

Gonzalez-Padilla, Everardo. Evaluation of crisscross breeding systems involving Angus, Hereford, and Brahman for beef production in the Everglades. M. S. Thesis. University of Florida. 1969.

VII. PUBLICATIONS PLANNED:

Abstract in Journal of Animal Science

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56

UNIVERSITY OF FLORIDA
Agricultural Experiment Station
Gainesville, Florida

I. PROJECT: 1003

Inherent body size in cattle as related to adaptation to Florida's climatic environment.

II. OBJECTIVES:

To determine the performance of three different groups of beef cattle selected respectively for:

1. Large skeletal and body size

2. Adaptation to Florida climate as reflected in thrift and vitality, and

3. The combination of weight and grade to give the greatest economic returns per animal unit.

III. PERSONNEL:

M. Koger, F. S. Baker and A. C. Warnick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two groups of 400 cows each are being used in a selection experiment. One group is being selected for large skeletal size to determine the effect this has on adaptability to Florida. Another group is being selected for indications of adaptability, measured mainly by condition score to determine whether animals selected for this trait tend toward any particular size. The project has not been under way long enough for the groups to become distinct.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

RANGE CATTLE EXPERIMENT STATION
Ona, Florida

I. PROJECT: 1120

Charolais, Brahman, Angus and their crosses for beef production in South Florida.

II. OBJECTIVES:

To evaluate the relative productivity of Charolais, Brahman, Angus and their crosses for beef production in South Florida.

III. PERSONNEL:

F. M. Peacock, E. M. Hodges, H. L. Chapman and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

Angus, Brahman and Charolais bulls are being mated to females of the same breeds in all possible combinations to produce straightbred and crossbred progeny. The three groups of F_1 females likewise will be mated to the three breeds of bulls to produce backcross and three-breed cross progeny. A minimum of 90 straightbred females (10 per subgroup) are bred each year. A comparable number of crossbred females will be added to the project as they are produced. The post-weaning and feedlot performance of progeny produced in the trial are evaluated in a companion study. The fifth calf crop was weaned in 1968. The production data in 1968 are not presented because breed groups and environment were confounded due to drought.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Preliminary report presented at short course.

VII. PUBLICATIONS PLANNED:

None

NORTH FLORIDA EXPERIMENT STATION
Quincy, Florida

I. PROJECT: 1180

Selection of replacement females in beef cattle.

II. OBJECTIVES:

To compare genetic progress and economic returns from selecting replacements on their own calfhood performance versus selection on the basis of production records.

III. PERSONNEL:

F. S. Baker, Jr. and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

The 1968 calf crop represented the third year's production following the initiation of the selection procedures outlined for females. The weaning data from the 1968 calf crop is summarized in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida
(Project located at Brighton Seminole Indian Reservation)

I. PROJECT: 1263

Selection for maternal ability in beef cattle.

II. OBJECTIVES:

To compare maternal ability and individual excellence in weight and grade at 20 months of age as selection criteria in improvement of beef cattle.

To produce herd sires from adapted Hereford cattle for use in tribal herds.

III. PERSONNEL:

J. R. Crockett, D. W. Beardsley and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

There were 286 breeding age females in the project. The data are shown in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Field day report on progress to date

VII. PUBLICATIONS PLANNED:

None

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

Location		Gainesville	Gainesville	Gainesville	Gainesville	Raiford
Breed of sire		A or H	A & H	A & BRA	H & SG	Angus
Breed of dam		Grade A Grade H	Crossbred	Crossbred	Crossbred	Gr. Angus
Line or group[1]		Straight-breds	AH Criss-cross	AB Criss-Cross	HSG Criss-Cross	Combined[a]
Percent used in project		50	50	50	50	100[b]
Inventory as of July 1, 1969	Cows 2 years and over	57	56	53	47	926
	Yearling heifers	31	22	29	16	353
	Bulls and steers under 1 year	23	26	23	15	350
	Heifers under 1 year	24	24	25	18	350
	Bulls over 1 year	4	2	2	2	45
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	92	89	90	78	90
	Calf survival percent[3]	96	100	99	96	91
Wean. perf.	Adj. ADG[4]	1.77	1.85	1.87	2.03	1.59
	Av. type sc.[5]	12.4	12.3	11.9	12.8	10.6
Postweaning performance	No. of bulls	0	0	0	0	0
	No. of heifers	31	22	29	16	
	No. of steers	16	25	17	20	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	19	22	17	21	0
Remarks	[a]groups combined [b]cattle owned by cooperator					

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

Location		Quincy	Quincy	Belle Glade	Belle Glade	Belle Glade
Breed of sire		Angus	Angus	Angus	Angus	Brangus
Breed of dam		Angus	Angus	Angus	Crossbred	Brangus
Line or group[1]		Maternal ability	Control	Angus	Crisscross	Brangus
Percent used in project		50	50	100[a]	100[a]	100[a]
Inventory as of July 1, 1969	Cows 2 years and over	49	45	157	654	380
	Yearling heifers	15	15	34	211	88
	Bulls and steers under 1 year	17	16	48	200	100
	Heifers under 1 year	17	16	48	200	100
	Bulls over 1 year	14	15	8	35	20
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	92	95	73	89	87
	Calf survival percent[3]	94	94	78	94	92
Wean. perf.	Adj. ADG[4]	1.96	1.96	1.22	1.60	1.63
	Av. type sc.[5]	11	11	9	10	10
Postweaning performance	No. of bulls	13	14	0	0	0
	No. of heifers	15	15	34	211	88
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0

Remarks [a]cattle owned by cooperator

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

	Location	Brighton	Belle Glade	Belle Glade	Belle Glade	Belle Glade
	Breed of sire	Hereford	Angus	Brahman	Hereford	A & B
	Breed of dam	Grade Hereford	Angus	Brahman	Hereford	AB Criss-Cross
	Line or group[1]	Combined[a]	Angus	Brahman	Hereford	AB Criss-Cross
	Percent used in project	100[b]	75	75	75	75
Inventory as of July 1, 1969	Cows 2 years and over	286	43	43	45	103
	Yearling heifers	104	12	12	15	36
	Bulls and steers under 1 year	125	14	14	16	39
	Heifers under 1 year	125	14	13	16	39
	Bulls over 1 year	110	5	5	5	0
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	84	76	87	87	78
	Calf survival percent[3]	90	93	76	92	94
Wean. perf.	Adj. ADG[4]	1.82	1.66	1.75	1.73	2.00
	Av. type sc.[5]	10.5	12.2	9.7	11.6	11.7
Postweaning performance	No. of bulls	96	0	0	0	0
	No. of heifers	104	12	12	15	36
	No. of steers	0	8	8	8	8
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	8	8	8	8
Remarks	[a]groups combined	[b]cattle owned by cooperator				

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

Location		Belle Glade	Belle Glade		Range Cattle Station	
Breed of sire		A & H	B & H		A, C, B	
Breed of dam		AH Criss-Cross	BH Criss-Cross		Various	
Line or group[1]		AH Criss-Cross	BH Criss-Cross		Proj. 1120	
Percent used in project		75	75		100	
Inventory as of July 1, 1969	Cows 2 years and over	92	93		181	
	Yearling heifers	36	36		34	
	Bulls and steers under 1 year	35	34		70	
	Heifers under 1 year	33	34		70	
	Bulls over 1 year	0	0		9	
	Steers over 1 year	0	0		0	
Repro. perf.	Percent pregnant[2]	82	84		a	
	Calf survival percent[3]	91	94		a	
Wean. perf.	Adj. ADG[4]	1.76	2.01		a	
	Av. type sc.[5]	12.1	11.4		a	
Postweaning performance	No. of bulls	0	0		0	
	No. of heifers	12	12		34	
	No. of steers	8	8		35	
Slaughtered	No. of bulls	0	0		0	
	No. of heifers	0	0		0	
	No. of steers	8	8		35	
Remarks	[a]production data unreported due to drought					

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

BROOKSVILLE BEEF CATTLE RESEARCH STATION
Brooksville, Florida

I. PROJECT: Work Unit No. 03-30-013-10-03 State Project 1186
-27-04

A study of response to selection and genetic-environmental interaction in genetically similar groups of Hereford cattle at two locations (Miles City, Montana and Brooksville, Florida).

II. OBJECTIVES:

1. To determine whether originally genetically similar groups of cattle bred and selected for several generations according to the same criteria in the two markedly different environmental conditions of Miles City, Montana and Brooksville, Florida become genetically different or remain similar.

2. To estimate the importance of genetic-environmental interaction within a British breed of beef cattle.

3. To determine the importance of adaptation to a specific location if maximum productivity is to be attained.

III. PERSONNEL:

Project committee composed of the following persons: Representatives of the Florida and Montana Agricultural Experiment Stations as designated by the respective directors; Superintendents of the Miles City and Brooksville stations, plus not more than one additional person from each station; the W-1 and S-10 Regional Coordinators; and the Chief of the Beef Cattle Research Branch, U. S. Department of Agriculture (Chairman).

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. The sixth calf crop has been weaned.

2. Performance of G.E.I. cattle in 1968 was as follows:

Line	No.	Age at Wean.	Sl. Grade	Feeder Grade	Weaning Weight	Adj. Daily Gain	Conception Rate
4	48	222	7.8	11.3	414	1.66	64.0
5	15	221	8.0	11.4	422	1.68	73.0
6	37	225	9.0	11.8	452	1.81	88.0

3. Cows and heifers were bled one time at Brooksville and Miles City to determine the thyroid activity by the % uptake of Triiodothyroxine by the blood in vitro. There was a highly significant difference between the Brooksville and Miles City cows and also between locations in thyroid activity.

4. Milk production was initiated with the results of one milking to date as follows:

Line	No. Cows	Avg. Milk Production (lbs.)
4	51	6.19
5	14	5.54
6	39	8.51

V. FUTURE PLANS:

Continue on the project outline.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

A formal publication should be published this year on the first phase of the project.

I. PROJECT: State Project 1245

Three months versus twelve months breeding season for beef cattle.

II. OBJECTIVES:

To compare the reproductive and weaning performance of Brahman and Santa Gertrudis cows bred during three-month and continuous 12-month breeding seasons.

III. PERSONNEL:

Leaders:

A. C. Warnick, Florida Experiment Station, Gainesville, Florida
M. Koger, Florida Experiment Station, Gainesville, Florida
W. C. Burns, U. S. Department of Agriculture, Brooksville, Florida

Cooperators:

S-10 Coordinator, U. S. D. A.

IV. ACCOMPLISHMENTS DURING THE YEAR:

This project was terminated in March, 1969. There was no difference in the conception rate of the year-round versus 90-day breeding season in the Brahman and Santa Gertrudis breeds.

V. FUTURE PLANS:

Replace this project with one that covers only the Brahman cattle.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

A publication will be forthcoming when the calves are weaned the last of August.

I. PROJECT:

Miscellaneous project on Angus cows.
Milk production and twinning.

II. OBJECTIVES:

1. Milk Production

To determine levels of milk production in Angus cattle and to correlate the amount of milk to production traits.

2. Twinning

To study the effect of MAP feeding and FSH injections on heat in lactating Angus cows.

III. PERSONNEL:

Dr. Marvin Koger, University of Florida, Gainesville, Florida
Dr. A. C. Warnick, University of Florida, Gainesville, Florida
James Dickey, Graduate Fellow, University of Florida, Gainesville, Florida
W. C. Burns, Superintendent, Brooksville Beef Cattle Research Station, Brooksville, Florida

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Milk Production

Milk production on 119 Angus cows, in six different breeding groups, was obtained in March. The average milk production was 7.40 pounds for the 119 head. However, there was as much as 2.5 pounds difference between the high and low group. The 7.40 pound average for the Angus compares to 6.97 pounds for 104 Hereford cows.

2. Twinning

Group	No. Cows	No. in heat	% in heat	Interval end of feeding to heat (days)
(1) MAP feeding alone	15	4	27	2.5
(2) MAP + FSH 6.25 mg. total 2X for 5 days	15	6	40	4.7
(3) MAP + FSH 6.25 mg. 2X for 5 days	15	2	13	2.5
2 & 3 combined	30	8	27	4.1
(4) MAP + FSH 10 mg. single injection at end of feeding MAP	15	8	53	2.5
(5) Control-No treatment	60	11	18	2.9

V. FUTURE PLANS:

Continue to obtain milk production on the Angus cows and to get a formal breeding project approved. Future work on the twinning is not known at the present time.

VI. PUBLICATIONS:

None

VII. PUBLICATIONS PLANNED:

None for this year.

I. PROJECT:

Miscellaneous projects.
Wintering program on Angus cows.

II. OBJECTIVES:

To determine the value of Sorgum silage, grass hay, cottonseed pellets and non-protein nitrogen pellet in wintering Angus cows.

III. PERSONNEL:

Dr. Clarence Ammerman, University of Florida, Gainesville, Florida
W. C. Burns, Superintendent, Brooksville Beef Cattle Research Station, Brooksville, Florida

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two years data indicate there is no difference in the performance of Angus cows in weight change, conception rate and weaning weight in the four wintering programs.

V. FUTURE PLANS:

Conduct the wintering trials one more year.

VI. PUBLICATIONS:

None

VII. PUBLICATIONS PLANNED:

None

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

Location		Brooksville	Brooksville	Brooksville	Brooksville	Brooksville
Breed of sire		Angus	Brahman	Hereford	Hereford	Hereford
Breed of dam		Angus	Brahman	Hereford	Hereford	Hereford
Line or group[1]		Purebred	Purebred	Line 4	Line 5	Line 6
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	174	50	77	21	54
	Yearling heifers	25	11	28	8	20
	Bulls and steers under 1 year	59	23	33	7	23
	Heifers under 1 year	61	14	20	8	17
	Bulls over 1 year	47	15	26	9	21
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	62*	56	64	73	88
	Calf survival percent[3]	92	86	92	100	92
Wean. perf.	Adj. ADG[4]	1.73	1.65	1.66	1.68	1.81
	Av. type sc.[5]	11.8	10.6	11.3	11.4	11.8
Postweaning performance	No. of bulls	38	12	20	7	18
	No. of heifers	25	11	28	8	20
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0

Remarks *Includes 11 head of open two-year old heifers bred out of season

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Florida

Location		Brooksville				
Breed of sire		Santa G.				
Breed of dam		Santa G.				
Line or group[1]		Purebred				
Percent used in project		100				
Inventory as of July 1, 1969	Cows 2 years and over	67				
	Yearling heifers	10				
	Bulls and steers under 1 year	18				
	Heifers under 1 year	24				
	Bulls over 1 year	16				
	Steers over 1 year	0				
Repro. perf.	Percent pregnant[2]	52				
	Calf survival percent[3]	73				
Wean. perf.	Adj. ADG[4]	2.01				
	Av. type sc.[5]	10.8				
Postweaning performance	No. of bulls	12				
	No. of heifers	10				
	No. of steers	0				
Slaughtered	No. of bulls	0				
	No. of heifers	0				
	No. of steers	0				
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

GEORGIA COASTAL PLAIN EXPERIMENT STATION
Tifton, Georgia

I. PROJECT: State 2-99 (S-10)

Selection of beef cattle for single items of importance in profitable beef production.

II. OBJECTIVES:

To obtain preliminary information on the relative effectiveness of selecting for a single character.

To observe trends in characters for which no selection is made when selection is for a single character.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Four herds of grade Polled Hereford females, owned and maintained by the Georgia State Prison Farm, Reidsville, are used to study selecting for (1) weaning weight, (2) rate of postweaning gain, (3) type score, and (4) average performance. For the latter group, replacements with records nearest average for each trait are selected. Bulls used in all four groups are selected from the Polled Hereford herd at Tifton. Weaning data for the 1968 calf crop are shown in tables 1 and 2.

Table 1. Weaning Data, Generation 1 Cows, 1968 Calf Crop

Herd	No. calves weaned	Avg. birth weight	ADG-birth to weaning	Weaning scores	
				Type	Condition
Average	31	71	1.53	10.5	8.1
Rate of gain	28	74	1.48	10.3	8.3
Score	34	70	1.57	11.2	8.5
Wean. weight	39	77	1.55	10.3	8.1

Table 2. Weaning Data, Generation 2 Cows, 1968 Calf Crop

Herd	No. calves weaned	Avg. birth weight	ADG-birth to weaning	Weaning scores	
				Type	Condition
Average	18	69	1.39	10.1	7.9
Rate of gain	13	74	1.43	10.3	8.2
Score	19	70	1.57	11.0	8.5
Wean. weight	18	74	1.52	10.0	8.0

Fifty generation 2 steers randomly selected from within each sire-herd group in the 1967 calf crop were grazed and managed as a group until slaughtered in August, 1968. This was the first carcass data for generation 2. The data for these herds are shown in table 3.

Table 3. Growth and Carcass Data - Generation 2 Steers

Herd	Post-weaning daily gain	Wt./ day of age	Carcass wt./ day of age	Carcass grade	Area rib eye per cwt./ carcass	Rib eye fat, inches
Wean wt.	1.72	1.76	1.02	9.8	1.60	0.70
Rate of gain	1.71	1.69	0.99	9.3	1.69	0.72
Score	1.57	1.64	0.97	9.5	1.70	0.71
Average	1.62	1.71	1.00	9.5	1.74	0.72

V. FUTURE PLANS:

The project will be continued as outlined. Selection of generation 2 females was completed from the 1968 calf crop.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

A manuscript containing data from foundation cows (generation 1 animals) has been prepared and will be published in the August 1969 issue of the Journal of Animal Science.

Submitted by: W. C. McCormick

I. PROJECT: Animal Husbandry 209, AHRD d1-3 (S-10)

A study of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

II. OBJECTIVES:

To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

To study heterotic effects in crosses between Angus and Polled Hereford breeds, as compared to heterosis in crosses between these breeds and Santa Gertrudis - a breed based partially on a Brahman foundation.

To study the comparative value of the Santa Gertrudis breed with the Angus and Polled Hereford breeds.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weaning data for the 1968 calf crop raised by generation 1 cows are as shown in table 1.

Table 1. Weaning Data, 1968 Calves, Generation 1 Cows

Herd	Breeding system	No. calves born	Avg. birth wt.	ADG birth to weaning	Avg. type score	Average condition score
Gr. A	Grading-up	18	70	1.66	11.2	8.4
Gr. PH	Grading-up	17	68	1.44	10.1	7.8
Gr. SG	Grading-up	17	76	2.02	10.5	9.1
AxPH	Crisscrossing	19	69	1.58	10.4	8.3
AxSG	Crisscrossing	14	72	1.91	10.8	9.1
PHxSG	Crisscrossing	15	74	1.89	10.5	9.0
AxPHxSG	Rotational crossing	27	74	1.85	11.1	9.1

Weaning data for the 1968 calf crop raised by generation 2 animals are as shown in table 2.

Table 2. Weaning Data, 1968 Calves, Generation 2 Cows

Herd	Breeding system	No. calves born	Avg. birth wt.	ADG birth to weaning	Avg. type score	Average condition score
Gr. A	Grading-up	20	60	1.48	10.7	8.1
Gr. PH	Grading-up	24	72	1.48	10.3	8.0
Gr. SG	Grading-up	20	70	1.95	10.0	8.7
AxPH	Crisscrossing	22	69	1.59	10.8	8.5
AxSG	Crisscrossing	23	70	1.80	10.5	8.9
PHxSG	Crisscrossing	18	70	1.84	10.2	8.8
AxPHxSG	Rotational crossing	29	72	1.78	11.0	8.9

V. FUTURE PLANS:

The studies will be continued as planned.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

Data for generation 1 animals completely analyzed and prepared for publication. Several reviewers suggested that data for generation 1 and generation 2 be combined in the same publication. Generation 2 data is being analyzed and results for both generations will be combined.

Submitted by: W. C. McCormick

I. PROJECT: Animal Husbandry 224, AHRD d1-3 (S-10)

Improvement of performance and carcass quality in beef cattle through selection.

II. OBJECTIVES:

To develop herds of Polled Hereford and Angus cattle with superior performance.

To progeny test Polled Hereford and Angus sires with selection criteria based primarily on pre- and postweaning growth rate, and carcass meatiness and tenderness.

III. PERSONNEL:

Hollis D. Chapman and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

The Polled Hereford herd of around 109 females was mated naturally with five sires (195, 316, 367, 546 and 853). Some of the Angus cows were bred artificially to "Executor" and J339 while the remainder were bred naturally to 518 and 556. The calves produced by these matings were born from January to March 1968.

All bull calves were creep fed for approximately six weeks before being weaned in order to precondition them for performance testing. The bulls were placed on 168-day postweaning gain test immediately following weaning (September 10, 1968). At weaning, prospective breeding heifers were separated and placed on pasture. Restricted grain feeding was practiced until small grain pasture was ready to graze. Thereafter, grain feeding was discontinued. Average performance records for all sires are shown in table 1 for bull calves only. At the end of the feeding period, calves sired by Polled Hereford sires 546 and 316 and Angus sire 556 were slaughtered to obtain carcass data as shown in table 2.

Table 1. Growth and Feedlot Data

Breed	Sire	No. bull calves	Weaned weight	Feedlot daily gain	Final age	Wt./day of age	Type score
PH	195	8	488	2.46	393	2.29	12.0
PH	316	4	416	3.09	376	2.56	12.2
PH	367	11	461	2.79	384	2.39	11.7
PH	546	8	428	2.40	380	2.19	11.5
PH	853	11	488	2.83	391	2.51	12.6
A	J339	3	461	2.58	386	2.31	12.3
A	518	8	492	2.80	391	2.47	12.4
A	556	5	416	2.52	359	2.32	11.8
A	Ex	9	491	2.74	379	2.51	12.3

Table 2. Carcass Data

Breed	Sire	No. killed	Dressing percent	Avg. rib eye fat thickness	Avg. rib eye area/ cwt carcass	Carcass wt./day of age	Carcass length
PH	316	9	58.3	0.72	2.17	1.22	43.3
PH	546	10	56.7	0.51	2.34	0.99	41.3
A	556	8	58.0	0.57	2.35	1.13	41.9

V. FUTURE PLANS:

The project is being considered for revision.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

Pending on the review of the data collected since 1936. Analyses are planned and a station publication will follow if deemed appropriate.

Submitted by: W. C. McCormick

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Georgia

Location		Reidsville	Reidsville	Reidsville	Reidsville	
Breed of sire		PH	PH	PH	PH	
Breed of dam		Gr. PH	Gr. PH	Gr. PH	Gr. PH	
Line or group[1]		Wean wt.	Rate gain	Type	Average	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1969	Cows 2 years and over	52	52	52	52	
	Yearling heifers	26	19	21	26	
	Bulls and steers under 1 year	21	16	23	20	
	Heifers under 1 year	29	20	25	25	
	Bulls over 1 year	2	2	2	2	
	Steers over 1 year	14	14	14	14	
Repro. perf.	Percent pregnant[2]	92	90	92	96	
	Calf survival percent[3]	100	95	96	98	
Wean. perf.	Adj. ADG[4]	1.54	1.47	1.57	1.48	
	Av. type sc.[5]	10.2	10.3	11.1	10.4	
Postweaning performance	No. of bulls	0	0	0	0	
	No. of heifers	25	19	20	26	
	No. of steers	14	14	14	14	
Slaughtered	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	12	13	13	11	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: none

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Georgia

Location		Reidsville	Reidsville	Reidsville	Reidsville	Reidsville
Breed of sire		A	PH	SG	A, PH	A, SG
Breed of dam		Gr. A	Gr. PH	Gr. SG	A x PH	A x SG
Line or group[1]		Grade	Grade	Grade	Crisscross	Crisscross
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	41	45	42	51	46
	Yearling heifers	20	10	16	15	16
	Bulls and steers under 1 year	18	22	14	26	25
	Heifers under 1 year	13	18	14	17	13
	Bulls over 1 year	4	4	4	*	*
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	88	98	90	89	88
	Calf survival percent[3]	97	90	86	95	100
Wean. perf.	Adj. ADG[4]	1.56	1.47	1.98	1.59	1.84
	Av. type sc.[5]	10.9	10.2	10.2	10.6	10.6
Postweaning performance	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks		*Same bulls used in three grade groups				

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

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Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Georgia

Location		Reidsville	Reidsville		Tifton	Tifton
Breed of sire		PH, SG	A, PH, SG		PH	A
Breed of dam		PH x SG	AxPHxSG		PH	A
Line or group[1]		Crisscross	Rotational Cross		Purebred	Purebred
Percent used in project		100	100		80	80
Inventory as of July 1, 1969	Cows 2 years and over	41	65		86	46
	Yearling heifers	15	27		33	11
	Bulls and steers under 1 year	22	23		40	26
	Heifers under 1 year	14	30		46	18
	Bulls over 1 year	**	**		7	4
	Steers over 1 year	0	0		0	0
Repro. perf.	Percent pregnant[2]	77	92		85	88
	Calf survival percent[3]	100	100		95	100
Wean. perf.	Adj. ADG[4]	1.86	1.81		1.84*	1.86*
	Av. type sc.[5]	10.3	11.0		11.5	12.0
Postweaning performance	No. of bulls	0	0		37	25
	No. of heifers	0	0		46	20
	No. of steers	0	0		0	0
Slaughtered	No. of bulls	0	0		6	3
	No. of heifers	0	0		13	5
	No. of steers	0	0		0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: *Sex(to steer basis) and age of dam
**Same bulls used in three grade groups.
5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF KENTUCKY
Agriculture Experiment Station
Lexington, Kentucky

I. PROJECT: Animal Science 260 (S-10)

Measurement and selection of economically important traits in beef cattle.

II. OBJECTIVES:

To use rate of gain, efficiency of gain, conformation and carcass characteristics in an overall selection experiment.

III. PERSONNEL:

F. A. Thrift, N. W. Bradley, J. D. Kemp and W. P. Garrigus

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Breeding, calving and culling of cows. During April, May and June of 1968, 228 females (40 heifers and 188 cows) were exposed to 7 bulls. Nineteen of these 228 females (16 cows and 3 heifers) were culled from the herd during the fall of 1968 because of their failure to conceive. Also, 11 pregnant cows were culled at this time on the basis of health and their prior reproductive performance. Of the 30 cows culled, 27 were transferred to another project and the remaining 3 were sold because of cancer eye. On January 1, 1969, there were 37, 2-year-old heifers and 155 older (3+) cows available to calve. All of the 37 heifers calved; whereas, only 146 of the 155 cows calved. Seventeen calves (46 %) were lost from the heifers during the calving season compared to 19 calves (13 %) from the older cows. These calf death losses appear to be random with respect to sire. There was an average of 5 calves lost for each of the 7 sires with a range of 4 to 6.

2. Selection of replacements. There were 147 calves (69 bulls and 78 heifers) reared that were born during the 1968 calving season and these were weaned at an average age of 207 days. Approximately 10 days after weaning, the bulls were placed on a 160-day postweaning feeding test; whereas, the heifers remained on pasture until about December 15 at which time they received enough corn silage and supplemental grain to gain approximately 1.0 - 1.25 pounds per day during the remainder of the 160-day test period. The postweaning feeding test was concluded on 2/27/69 and 5 of the 69 bulls were selected on the basis of their growth performance for possible future use in the herd. At the same time the bulls were weighed off the postweaning test, the heifers were also weighed and their performance evaluated. Of the 78 heifers available to select from, 45 (12 sires represented) were retained as replacements and the remaining 33 heifers were transferred to another project. A comparison of the performance of the selected bulls and heifers with the performance of all bulls and heifers, respectively, is presented in table 1.

Table 1. Comparison of the Growth Data of Selected Bulls (SB) and Heifers (SH) with all Bulls (AB) and Heifers (AH), Respectively (1968 Calves)

	Preweaning			Postweaning		
	No.	Adj. ADG	Adj. 205-day[a] Wt.	ADG	WDA	Adj. 365-day[a] Wt.
Selected Bulls (SB)	5	1.79	447	2.79	2.40	892
All Bulls (AB)	69	1.67	417	2.34	2.13	791
Difference (SB-AB)		+.12	+30	+.45	+.27	+101
Selected Heifers (SH)	45	1.59	394	1.13	1.54	575
All Heifers (AH)	78	1.47	368	1.05	1.44	536
Difference (SH-AH)		+.12	+26	+.08	+.10	+39

[a]Adjusted for age of dam.

3. Collection of carcass data. After the five bulls were selected, all remaining 64 bulls were slaughtered and carcass data obtained. Certain of the carcass traits are summarized according to sire in table 2. These data will be pooled with previously collected carcass data in order to determine the relationships between various preweaning, postweaning and carcass traits of young bulls.

4. Collection of blood data. At the time the bulls and heifers were weighed off postweaning test, blood samples were collected from 50 of the bulls and 50 of the heifers. The bulls and heifers were separated into high and low-gaining groups on the basis of their growth performance. Within each of the two groups, the blood samples will be analyzed for various blood metabolites to determine if these metabolites differ for the high and low-gaining groups. Blood samples were also obtained on June 1 from the calves born during January and February, 1969. Additional blood samples will be obtained from these calves at weaning, half way through the postweaning feeding test and at the termination of the postweaning test.

5. Fire and freeze branding of all females. All cows and replacement heifers were identified as to their individual herd number by using both fire and freeze branding just prior to the beginning of the 1969 breeding season. Each female was branded on both sides just behind the shoulder with one side being fire branded and the other side freeze branded. The freeze brands were applied using a time interval of 50-55 seconds.

6. Effect of sire, sex and sire x sex interactions on certain traits. Data were analyzed to estimate the effect of sire, sex and sire x sex interactions on certain performance and carcass traits in Hereford cattle. The data utilized were collected in cooperation with a commercial Hereford farm located near Lexington. Eight Hereford bulls were each exposed during the early spring of 1966 to 27 to 30 grade Hereford cows. The breeding groups were established by randomly allotting 227 cows on a within age-of-dam basis to eight different groups. The sires were then randomly allotted to the eight groups. From 119 calves weaned, 80 were selected as a representative sample to be placed on postweaning feeding test to evaluate differences among the eight sires with respect to certain performance and carcass traits. The eight sires were each represented by ten calves with both steers and heifers included for each sire. The average weaning age for these 80 calves was 191 days. The number of offspring included in this study is presented in table 3 according to sire and sex classification. This table shows that two of the sires were each represented by only nine calves. Upon slaughter at the end of the postweaning feeding period, it was found that two of the male calves still had one testicle retained due to improper castration. All performance and carcass data collected on these two calves were excluded from this study. After weaning the calves were placed on postweaning feeding test and received a full-feed of corn silage plus 1.4 kg. of shelled corn and 0.34 kg. of soybean meal per head per day. The postweaning feeding period was continued for 348 days at which time the 80 calves averaged approximately 409 kg.

Table 2. Carcass Traits of Progeny from Several Sires

Sire	No. progeny	Slaughter		Carcass		Fat[a] thick.	REA	Cutability[b] %
		Age	Wt.	Wt.	Wt./day/age			
C30	3	358	742	416	1.17	.13	10.2	53.5
Z6	2	370	715	409	1.10	.08	11.2	54.4
Z8	7	379	759	445	1.17	.23	11.2	53.5
TR8	11	398	821	476	1.20	.16	11.3	53.7
Z44	2	363	794	442	1.22	.25	9.8	52.2
58	5	417	781	461	1.10	.15	10.0	52.8
61	6	375	769	461	1.23	.18	11.1	53.8
62	4	377	779	466	1.24	.27	9.8	52.0
1109	1	403	752	438	1.09	.15	11.6	54.4
192	6	378	678	391	1.03	.14	10.0	53.5
0302	6	416	848	490	1.18	.25	10.8	52.5
3124	6	411	816	468	1.14	.17	11.0	53.6
576	5	371	739	415	1.12	.09	9.7	53.6

[a]Measures between 12th and 13th rib.
[b]Estimated boneless, trimmed retail cuts.

The means and standard deviations and analyses of variance for the performance and carcass traits are presented in tables 4 and 5, respectively. Sire was a significant source variation for weaning weight and grade, preweaning average daily gain, cold carcass weight, carcass weight per day of age, ribeye area/100 kg. carcass, estimated boneless, trimmed retail cuts, fat thickness at 12th rib and estimated percent fat from the kidney and pelvic regions. Sire differences observed for all other traits were small and nonsignificant.

Sex of calf was a significant source of variation for all performance traits and all carcass traits except marbling score and dressing percent. The least squares means for each trait are presented in table 6 for the steers and heifers. With respect to the performance traits, steers had a faster preweaning and postweaning rate of gain and were heavier at weaning and at the conclusion of the postweaning feeding period than the heifers. In addition, the steers received slightly higher grades at weaning and had a greater weight per day of age. Steers had heavier cold carcass weights, larger ribeye areas, greater carcass weight per day of age, larger estimated boneless, trimmed retail cuts and received higher carcass conformation scores. Heifers had greater fat thickness over the 12th rib and a greater percent of estimated fat from the kidney and pelvic regions and larger ribeye area when the ribeye area was expressed per 100 kg. of carcass. Marbling scores and dressing percents were equal for steers and heifers.

Table 5 reveals that the sire x sex interaction was not significant for any of the performance or carcass traits. Some of the interaction mean squares approached significance, but most of the F values were less than or slightly larger than 1 in magnitude.

7. Effect of sire on certain carcass traits of young bulls. Data collected on the carcasses of 59 Hereford bulls slaughtered after completion of a 160-day postweaning feeding test in 1967 were analyzed to estimate the effect of sire on certain carcass traits. These bulls averaged 400 days of age at the time of slaughter and were the progeny of eight sires (7.2 bulls/sire). Carcass data were collected 48 hours after slaughter, and a 9-10-11th rib section was obtained from the left side of each carcass and dissected into fat, lean and bone. The 6-7-8th portion of the rib was roasted to 160° F and evaluated for flavor, juiciness, tenderness and overall satisfaction by a palatability panel. The longissimus muscle from the 12th rib portion was analyzed for water, protein and ether extract. The means and standard deviations for the traits studied are presented in table 7. Each trait was analyzed using a model that took into account the effect of sire. Among and within sire mean squares were equated to expected mean squares and variance components estimated. These variance components for the various traits are presented in table 8. Of the 27 traits, nine of the sire variance components were negative, and these were assumed to be estimating zero. These results are probably due in part to sampling error, since only a small number of sires are represented.

V. FUTURE PLANS:

Future plans are to revise the project.

Table 3. Number of Offspring by Sire and Sex Classification

Sex	Sire 1	2	3	4	5	6	7	8	Total
Steers	4	4	2	4	5	6	5	4	34
Heifers	6	6	8	5	5	4	5	5	44
Total	10	10	10	9	10	10	10	9	78

Table 4. Means and Standard Deviations for Performance and Carcass Traits

Trait	Mean	S.D.
Performance traits:		
Preweaning ADG, kg.	0.61	0.09
200-day wt., kg.	163.6	18.2
Weaning grade[a]	11.3	0.9
Postweaning ADG, kg.	0.77	0.08
Wt./day/age, kg.	0.77	0.07
Adj. final wt., kg.	432.7	38.2
Carcass traits:		
Cold carcass wt., kg.	245.0	22.7
Carcass wt./day/age, kg.	0.45	0.04
Ribeye area, $cm.^2$	74.2	7.7
Ribeye area, $cm.^2$/100 kg.	27.7	2.5
Estimated boneless, trimmed retail cuts, %	50.0	1.4
Carcass conformation[b]	12.5	1.5
Fat thickness at 12th rib, cm.	1.45	0.41
Marbling score[c]	5.2	1.4
Estimated fat from kidney and pelvic regions, %	3.4	0.7
Dressing percent	58.7	2.1

[a]10 = Average good; 11 = High good
[b]12 = Low choice; 13 = Average choice
[c] 5 = Small; 6 = Modest

Table 5. Analysis of Variance for Performance and Carcass Traits

Trait	Source of variation[a] Sire (7)	Sex (1)	Sire x Sex (7)	Error (62)
Performance traits:				
Preweaning ADG	0.078*	0.369**	0.035	0.030
200-day wt.	2997.3*	12,616.3**	1443.9	1303.1
Weaning grade	2.1**	10.5**	0.5	0.6
Postweaning ADG	0.023	0.618**	0.019	0.023
Wt./day/age	0.032	0.499**	0.021	0.017
Adj. final wt.	9677.8	146,052.8**	5798.5	4868.0
Carcass traits:				
Cold carcass wt.	4157.7*	49,446.5**	691.9	1817.9
Carcass wt./day/age	0.017**	0.157**	0.006	0.006
Ribeye area	1.49	5.35**	1.39	1.28
Ribeye area/100 kg. car.	0.086**	0.189**	0.039	0.028
Estimated boneless, trimmed retail cuts, %	6.5**	6.9**	1.1	1.4
Carcass conformation	2.9	21.6**	1.7	1.8
Fat thickness at 12th rib	0.060**	0.060**	0.006	0.020
Marbling score	2.32	0.09	1.48	1.85
Estimated fat from kidney and pelvic regions, %	0.72*	6.76**	0.36	0.30
Dressing percent	7.85	0.32	5.58	4.06

[a]Numbers in parentheses represent degrees of freedom.

* P <.05

** P <.01

Table 6. Least Squares Means for Steers and Heifers

Trait	Steers	Heifers	Difference (S-H)	Significance of difference
Performance traits:				
Preweaning ADG, kg.	0.65	0.58	0.07	*
200-day wt., kg.	170.5	158.2	12.3	**
Weaning grade[a]	11.7	10.9	0.8	**
Postweaning ADG, kg.	0.82	0.74	0.08	**
Wt./day/age, kg.	0.81	0.74	0.07	**
Adj. final wt., kg.	455.0	414.1	40.9	**
Carcass traits:				
Cold carcass wt., kg.	258.2	234.1	24.1	**
Carcass wt. /day/age, kg.	0.48	0.44	0.04	**
Ribeye area, $cm.^2$	76.1	72.2	3.9	**
Ribeye area, $cm.^2$/100 kg.	26.8	28.6	-1.8	**
Estimated boneless, trimmed retail cuts, %	50.3	49.7	0.6	**
Carcass conformation[b]	13.1	12.0	1.1	**
Fat thickness at 12th rib, cm.	1.35	1.50	-0.15	**
Marbling score[c]	5.2	5.2	0.0	N.S.
Estimated fat from kidney and pelvic regions, %	3.1	3.7	-0.6	**
Dressing percent	58.8	58.7	0.1	N.S.

[a] 10 = Average good; 11 = High good
[b] 12 = Low choice; 13 = Average choice
[c] 5 = Small; 6 = Modest
* P <.05
** P <.01

Table 7. Means and Standard Deviations for Carcass Traits of Young Bulls

Trait	Mean	S.D.
Routine traits:		
Slaughter wt.	795.0	69.2
Hot carcass wt.	482.0	46.1
Cold carcass wt.	470.0	45.0
Car. wt./day/age	1.2	0.1
Dressing %	59.1	1.8
Carcass conf.[a]	16.0	1.1
Marbling score[b]	4.0	0.5
USDA grade[c]	10.0	0.9
Fat thickness, 12th rib	0.3	0.1
% kidney & pelvic fat	2.0	0.4
Ribeye area (REA)	10.7	1.1
REA/100 lb. carcass	2.3	0.0
Cutability %	52.3	0.9
9-10-11th rib traits:		
Fat color score[d]	2.0	0.3
Lean color score[e]	6.0	1.4
% fat in rib	27.7	3.7
% ribeye in rib	18.6	1.5
% other lean in rib	35.4	2.5
% total lean in rib	54.0	3.0
% bone in rib	17.8	1.7
% water in lean	75.1	1.0
% protein in lean	20.0	0.9
% ether extract in lean	1.8	0.9
Flavor[f]	6.3	0.7
Juiciness[f]	6.9	0.6
Tenderness[f]	6.5	0.6
Overall satisfaction[f]	6.5	0.7

[a] 16 = Av. prime
[b] 4 = Slight
[c] 10 = Average good (based on steer standards)
[d] 2 = creamy white
[e] Muncell color paddle score; 1 = very light, 9 = very dark
[f] Evaluated by taste panel on a 9 point hedonic scale; 1 = dislike extremely, 9 = like extremely.

Table 8. Among and Within Sire Variance Components for Carcass Traits of Young Bulls

Trait	Variance components[a] Among sires[b] (7)	%	Within sires (51)	%
Routine traits:				
Slaughter wt.	490.0	9.3	4789.1	90.7
Hot carcass wt.	177.8	7.7	2129.2	92.3
Cold carcass wt.	170.3	7.8	2027.3	92.2
Car. wt./day/age	0.001	10.0	0.009	90.0
Dressing %	0.172	4.9	3.321	95.1
Carcass conf.	0.282	19.0	1.206	81.0
Marbling score	0.084	22.1	0.296	77.9
USDA grade	0.077	8.0	0.889	92.0
Fat thickness, 12th rib	-0.000	0.0	0.007	100.0
% kidney & pelvic fat	0.008	5.8	0.130	94.2
Ribeye area (REA)	0.041	3.2	1.260	96.8
REA/100 lb. carcass	-0.001	0.0	0.046	100.0
Cutability %	-0.054	0.0	0.795	100.0
9-10-11th rib traits:				
Fat color score	0.000	0.0	0.079	100.0
Lean color score	-0.137	0.0	1.963	100.0
% fat in rib	0.259	1.8	13.765	98.2
% ribeye in rib	-0.059	0.0	2.394	100.0
% other lean in rib	0.063	1.0	6.015	99.0
% total lean in rib	-0.591	0.0	9.096	100.0
% bone in rib	-0.029	0.0	2.744	100.0
% water in lean	-0.022	0.0	0.923	100.0
% protein in lean	0.065	7.9	0.762	92.1
% ether extract in lean	0.134	14.0	0.822	86.0
Flavor	0.005	1.0	0.501	99.0
Juiciness	0.035	9.8	0.321	90.2
Tenderness	-0.012	0.0	0.388	100.0
Overall satisfaction	0.008	1.9	0.421	98.1

[a]Numbers in parentheses represent degrees of freedom.
[b]Negative variance components were assumed to be estimating zero.

VI. PUBLICATIONS DURING THE YEAR:

Thrift, F. A., N. W. Bradley, J. D. Kemp and J. R. Overfield. 1968. Measurement and selection of economically important traits on beef cattle. Kentucky Animal Science Research Reports. Prog. Rpt. 176.

VII. PUBLICATIONS PLANNED:

The effect of sire, sex and sire x sex interactions on certain beef cattle performance and carcass traits.

Comparison of blood metabolites in high and low-gaining bulls and heifers.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Kentucky

Location		Princeton				
Breed of sire		Hereford				
Breed of dam		Hereford				
Line or group[1]		Purebred				
Percent used in project		100				
Inventory as of July 1, 1969	Cows 2 years and over	184				
	Yearling heifers	45				
	Bulls and steers under 1 year	62				
	Heifers under 1 year	83				
	Bulls over 1 year	18				
	Steers over 1 year	0				
Repro. perf.	Percent pregnant[2]	91				
	Calf survival percent[3]	79				
Wean. perf.	Adj. ADG[4]	1.56				
	Av. type sc.[5]	11.2				
Postweaning performance	No. of bulls	69				
	No. of heifers	78				
	No. of steers	0				
Slaughtered	No. of bulls	65				
	No. of heifers	0				
	No. of steers	0				
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam

5 - Suggest S-10 scoring system; indicate if different.

LOUISIANA STATE UNIVERSITY
Agricultural Experiment Station
Baton Rouge, Louisiana

I. PROJECT: Hatch 605 (Revised)

Evaluation of systematic rotational crossbreeding plans for producing beef cattle in the Gulf Coast region.

II. OBJECTIVES:

To evaluate systematic rotational crossbreeding plans as breeding systems for commercial beef production

To determine the degree of heterotic advantage maintained in subsequent generations of rotational crossbreeding

To determine the relative productivity of various types of crossbred cows

To estimate genetic parameters

To study specific crossbreeding programs of various breeds as to production, usefulness and practicality

To study management and production problems associated with crossbred cattle produced under systematic crossbreeding schemes.

III. PERSONNEL:

J. W. Turner, George L. Robertson, A. M. Mullins, C. K. Vincent, T. O. McRae, S. E. McCraine and Dorothy C. Wilson

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The 1968 calf crop was the last to be produced under the original project outline encompassing the Angus, Brahman, Brangus, Charolais and Hereford breeds. Data collection according to design was continued on these cattle.

During the latter part of 1968, 148 Brahman hybrid cows were purchased from Texas and Louisiana breeders to obtain the numbers required to initiate the revised project in the 1969 breeding season. The experimental herds now contain straightbred Angus, Brahman, Charolais and Hereford females and Brahman singlecrosses of Angus, Hereford and Charolais breeding. These females were bred to maintain production for the 1969 calf crop without reference to design.

Brangus and crossbred cows culled from the original herds due to breeding were incorporated into state supported research projects in reproductive physiology.

2. Research results

Analyses of preweaning, postweaning and carcass traits have been completed to determine mating-type effects. Several publications, popular and technical, have been prepared.

Table 1. Hybrid Vigor in Puberty Age of Beef Heifers

Classification[1]	Age at puberty		Parental average age at puberty		Per cent hybrid vigor
	No.	Days	No.	Days	
Angus-Brahman	11	431	19	435	0.9
Angus-Brangus	5	438	28	461	5.0
Angus-Hereford	16	367	31	449	18.3
Brahman-Brangus	2	488	21	535	8.8
Brahman-Hereford	12	449	24	522	14.0
Brangus-Hereford	6	476	33	504	5.5

[1]The group classification includes reciprocal cross heifers, i.e., the Angus-Brahman group includes both Angus x Brahman and Brahman x Angus heifers.

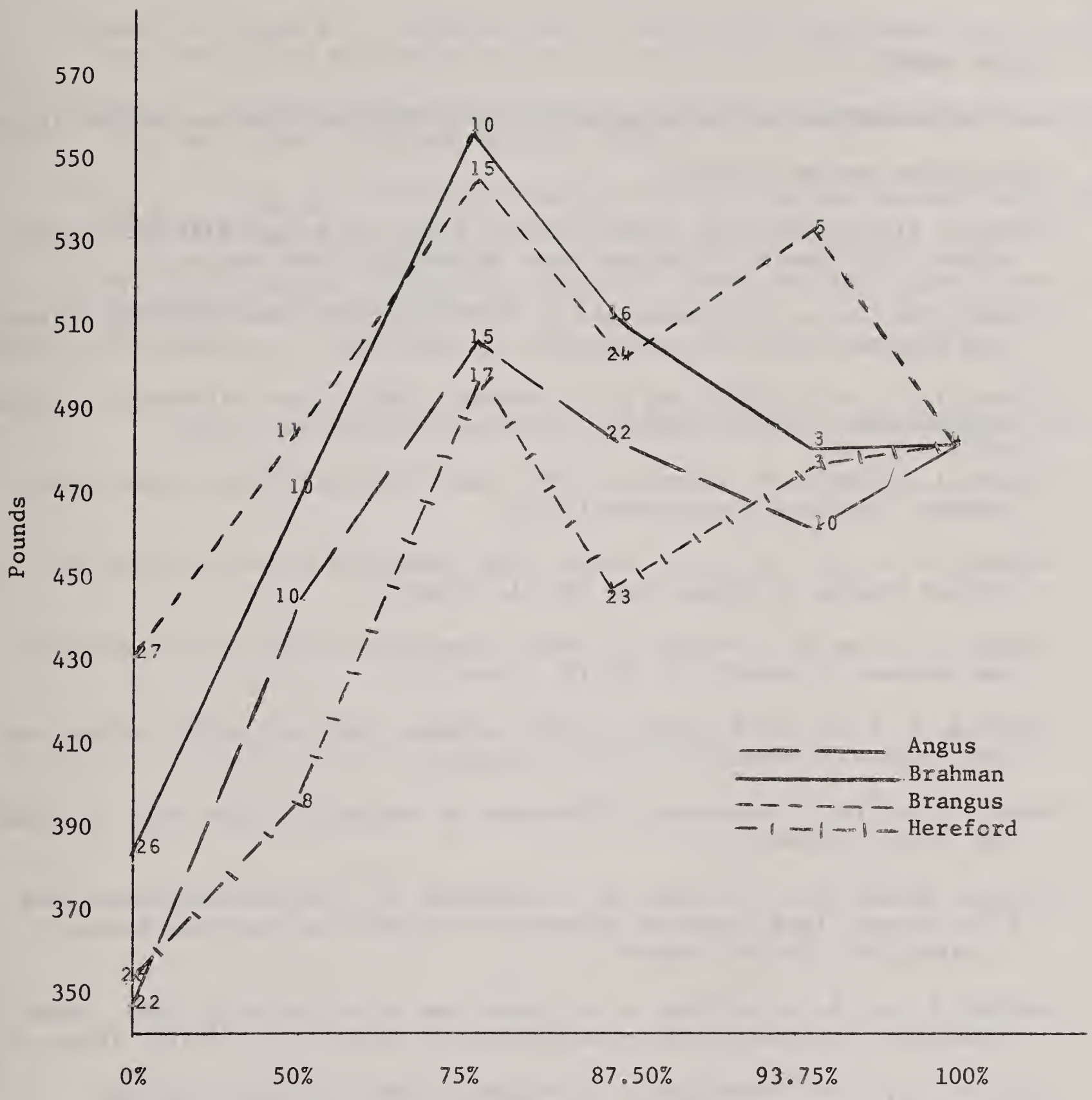
Preliminary study of puberty data indicates that heterotic effects are large for some crosses for age at puberty. Study of data from grade Charolais cattle by generation and foundation breed has indicated that preweaning traits are materially affected by heterosis (quadratic responses.) (See graph 1.) Foundation breed differences were noted.

Mr. Richard P. McDonald completed requirements for the Master of Science degree during the past year. His thesis was entitled "Parental Breed and Weight Effects on Beef Calves." Using 2 and 2-1/2 year old cow weights and approximately 18 month liveweights of bulls, preweaning traits were analyzed to determine the influence of parental weights. Sire weight did not significantly account for observed progeny variance, yet cow weight was found to account for significant variance. The data were limited and only linear regressions were tested. Heritability estimates were obtained for all preweaning traits studied using the crossbred base. These estimates were somewhat lower than generally found in the literature.

Table 2. Heritability Estimates and Regressions of Pre-Weaning Progeny Performance on Dam Weight

Trait	Heritability[a]	Dam weight regression
Birthweight	0.23	0.03249**
Weaning weight	0.29	0.11772**
Average daily gain	0.05	0.00041**
Type score	0.26	0.00058
Slaughter score	0.24	0.00041

[a]Average paternal half-sib estimate over breeds of sire.
**P<.01.



Graph 1. Weaning Weight[a]

[a]Number of observations are given with mean values in plots for each foundation group.

V. FUTURE PLANS:

Data collection and operation under the revised project outline will be followed.

VI. PUBLICATIONS DURING THE YEAR:

McDonald, Richard Peterson. 1969. Parental breed and weight effects on beef calves. M.S. Thesis. Louisiana State University, Baton Rouge, La.

Hansard, Sam L., A. S. Mohammed and J. W. Turner. 1968. Gestation age effects upon maternal-fetal zinc utilization in the bovine. J. Animal Sci. 27:1097.

Turner, J. W., K. S. Quirk and R. P. McDonald. 1968. Breed differences studied in development of beef heifers. Louisiana Agriculture 12:1:12.

Turner, J. W. and R. P. McDonald. 1969. Beef calf study favors three-breed crosses. Louisiana Agriculture 12:2:3.

Mailhes, J. B., Jr. and J. W. Turner. 1969. Heterosis in beef feedlot and carcass traits. J. Animal Sci. 28:131. (Abstr.).

Turner, J. W. and R. P. McDonald. 1969. Preweaning performance of crossbred beef calves. J. Animal Sci. 28:131. (Abstr.).

McDonald, R. P. and J. W. Turner. 1969. Parental breed and weight effects on beef calves. J. Animal Sci. 28:131. (Abstr.).

Turner, J. W. 1969. Production differences of reciprocal cross cows. J. Animal Sci. 28:131. (Abstr.).

Mullins, Auttis M., V. K. Wipf, F. L. Passbach, Jr., Richard Hutchinson and J. W. Turner. 1969. Cause of tenderness variation in crossbred steers. J. Animal Sci. 28:149. (Abstr.).

Goodner, E. A., A. M. Mullins, J. W. Turner and B. R. Farthing. 1969. Breed variations in carcass quality components. J. Animal Sci. 28:149. (Abstr.).

Mills, A. C., J. W. Turner and C. K. Vincent. 1969. Methods of estrual detection in crossbred cows. J. Animal Sci. 28:146. (Abstr.).

Tugwell, Phillip, E. C. Burns and J. W. Turner. 1969. Brahman breeding as a factor affecting the attractiveness or repellency of cattle to the Horn fly. J. of Econ. Ent. 62:1:56.

Turner, J. W. and J. B. Mailhes, Jr. 1969. For quality beef: Straightbreds or crossbreds? Louisiana Agriculture 12:3:6.

VII. PUBLICATIONS PLANNED:

Turner, J. W. and R. P. McDonald. 1969. Mating-type comparisons among crossbred beef cattle for preweaning traits. J. Animal Sci. (In press).

Turner, J. W. 1969. Preweaning production differences among reciprocal crossbred beef cows. J. Animal Sci. (In press).

Turner, J. W. et al. Heterotic effects in postweaning and carcass traits of beef steers.

Turner, J. W. et al. Mating type comparisons among crossbred beef steers for postweaning and carcass traits.

Submitted by: J. W. Turner, Project Leader
Ani. Sci. Dept.
L.S.U.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Louisiana

Location		Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire		(a)	(a)	(a)	(a)	(a)
Breed of dam		Angus	Angus cross	Brahman	Brahman cross	Brangus
Line or group[1]		(b)	(c)	(b)	(c)	(b)
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	35	35	30	95	0
	Yearling heifers	4	0	8	0	0
	Bulls and steers under 1 year	4	20	0	14	0
	Heifers under 1 year	3	16	0	20	0
	Bulls over 1 year	10	0	3	0	0
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	78	55	77	67	83
	Calf survival percent[3]	94	96	85	91	88
Wean. perf.	Adj. ADG[4]	1.74	1.81	1.77	1.97	1.83
	Av. type sc.[5]	11	11	10	11	11
Postweaning performance	No. of bulls					
	No. of heifers					
	No. of steers	3	22	2	14	3
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	3	21	2	13	3
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Louisiana

Location		Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of sire		(a)	(a)	(a)	(a)	(a)
Breed of dam		Brangus cross	Charolais	Charolais cross	Hereford	Hereford cross
Line or group[1]		(c)	(d)	(d)	(b)	(c)
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	0	2	57	29	45
	Yearling heifers	0	1	16	5	1
	Bulls and steers under 1 year	0	0	11	0	13
	Heifers under 1 year	0	0	28	0	17
	Bulls over 1 year	0	8	0	7	0
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	60	100	63	65	59
	Calf survival percent[3]	94	67	84	91	93
Wean. perf.	Adj. ADG[4]	1.83	2.04	2.00	1.58	1.88
	Av. type sc.[5]	11	11	12	11	11
Postweaning performance	No. of bulls					
	No. of heifers					
	No. of steers	15	1	27	2	28
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	14	1	25	2	26
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

EXPLANATORY NOTES

for

PRODUCTION, INVENTORY, AND PERFORMANCE DATA SHEETS

Louisiana Project 605 (S-10)

(a) All breeds of cows bred to five breeds of bulls (Angus, Brahman, Brangus, Charolais and Hereford).

(b) Straightbred cows bred to all five breeds of bulls to produce straightbred calves (Angus, Brahman, Brangus, Charolais and Hereford) and singlecross calves (A-B, B-A, A-BA, BA-A, A-H, H-A, B-H, H-B, H-BA, BA-H, B-BA, BA-B, C-A, C-B, C-BA, C-H).

(c) Crossbred cows bred to all five breeds of bulls to produce back-cross, 3-breed cross and rotational cross calves.

(d) Charolais and Charolais-cross cows bred to Charolais bulls.

[4] No adjustment on ADG.

[5] 10 represents Average Good with unit change equal to one-third grade.

IBERIA LIVESTOCK EXPERIMENT STATION
Jeanerette, Louisiana

I. PROJECT: 03-30-002-1906 (Revision No. 2)

Selection for changes in leanness of beef cattle and a study of the response to selection for adaptability in the Gulf Coast area.

II. OBJECTIVES:

To determine whether changes in leanness of Angus and Brangus cattle can be made by selection in opposite directions for fatness.

To estimate genetic and environmental relationships of fatness and leanness with other carcass and production traits.

To evaluate if more rapid adaptation and performance of Angus cattle to the Gulf Coast area can be made by selection of the best available bulls from within the area or by selection of the best available bulls from outside the area.

III. PERSONNEL:

T. M. DeRouen, D. C. Meyerhoeffer, W. L. Reynolds, A. M. Mullins, J. W. Turner, W. T. Butts, Jr. and P. A. Putnam

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope of work.

Data were collected on the several aspects of the study. A total of 305 cows were sorted into 22 single sire herds in the spring. In late summer and early fall, as the calves were weaned, the bull calves went directly into dry lot for a gain-evaluation test plus measurements for fat. The heifers went back to pasture and were supplemented with a small amount of concentrates. Over half the bull calves were slaughtered at the end of the feed test for carcass evaluation. Several other measurements were obtained during the course of the year and will be reported herewith.

2. Research results.

Breeding season and conception. The breeding season began on May 1, and ended on July 15. Bulls stayed with the cows on pasture for 75 days. Two of these herds of cows were bred by artificial insemination.

There were eight breeding herds each for the Brangus and Angus fat study. Four breeding herds in each breed were selected for high fat and four for low fat.

The Angus females in the fat study were high grade. Angus females in the adaptability study were sorted into six single sire breeding herds. Four of these herds were bred naturally to bulls raised and grown in the herd on the station. Two other herds were mated artificially to bulls raised outside the Gulf Coast area. The Angus cattle in the adaptability investigation are purebred.

All cows exposed to bulls during the breeding season were palpated in October. A summary of the conception rate is shown in Table 1.

Table 1. Summary of Palpation for 1968.

Breed	Line	No. Cows exposed	Percent pregnant
Brangus	Hi Fat	58	88
Brangus	Lo Fat	54	67
Angus	Hi Fat	44	80
Angus	Lo Fat	49	78
Angus	Adapt. Local	65	62
Angus	Adapt. Outside[a]	34	65
Totals & Averages		304	73

[a]Artificially inseminated.

The conception rate was dismally low for 1968. The Angus cows have usually had a much higher rate. Perhaps this low conception may be due to moving the breeding season to May 1. The higher temperature at this time may be detrimental to the fertility of both cows and bulls. It was noted that the conception rate of two and three-year old adaptability Angus females was very low. Most of these females were purchased heifers coming from several herds in Louisiana.

Calving. Calving losses in 1968 were about usual for the cattle at the station. The percent loss of all calves during the first 72 hours postparturition was 5%. There was no real difference among the different studies and breeds. Mortality of calves after 72 hours was 1%. A summary of these losses by breed and cause is presented in tables 2 and 3.

Death losses of calves due to exposure occurred during cold wet weather when the temperature dropped to 33 - 37° F and precipitation was 0.95 of an inch.

Table 2. Summary of Calving for 1968 (February 1 to April 26).

Breed	Losses 1st 72 hours				Losses after 72 hours				Totals		
	Bulls	Heifers	Dead No.	Dead %	Bulls	Heifers	Dead No.	Dead %	Dead No.	Dead %	Born No.
Brangus	5	0	5	6	1	0	1	1	6	7	84
Angus - Fat	2	2	4	6	0	1	1	1	5	7	67
Angus - Adpt.	2	0	2	4	0	0	0	0	2	4	55
Totals	9	2	11	5	1	1	2	1	13	6	206

Table 3. Summary of Causes of Mortality of Calves - 1st 72 hours.

Cause	Brangus	Angus Fat	Angus Adapt.
Premature	1	1	0
Exposure[a]	3	0	0
Stillborn	1	1	1
Drowned	0	1	1
Cleft Palate	0	1	0

[a]Rain and temperature 33° F - 37° F.

Cow performance - 1968 Calf Crop.

Brangus Cows: Calves in the low fat line grew faster, had a higher condition score and had about the same fat thickness at weaning as the high fat calves.

Angus (Fat) Cows: There was very little difference in the preweaning performance of the calves from either the low or high fat lines.

There is a trend, at this time, showing a tendency for the low fat cattle, in both breed groups, to make faster growth than the high fat cattle.

Angus (Adaptability) Cows: The local or closed line calves gained .16 of a pound faster than the outside or open line calves to weaning. It was also noted that the local line calves, at weaning, had a higher type and condition score.

Cow performance is summarized in table 4.

Table 4. Cow Production - 1968 Crop

Breed Group	Brangus Fat	Brangus Fat	Angus Fat	Angus Fat	Angus Adaptability	Angus Adaptability
Line	Hi Fat	Lo Fat	Hi Fat	Lo Fat	Local	Outside[5]
No. cows exposed	59	69	48	49	53	29
No. calves born[1]	43	41	31	36	36	20
Avg. birth wt.	61	67	55	58	55	57
No. calves weaned	39	39	29	32	33	19
% calves weaned	91	95	94	89	92	100
Avg. wean age (days)	180	180	181	182	180	180
Actual wean wt.	352	379	296	304	280	246
Adj. ADG[2]	1.74	1.86	1.44	1.47	1.39	1.23
Avg. type score[3]	10.0	10.5	11.2	11.0	11.4	10.6
Avg. condition score[3]	9.0	9.7	9.3	9.0	9.1	7.9
Fat thickness, mm.	4.4	4.6	4.2	4.0	----	----
Index[4]	110	115	105	106	105	98

[1]Includes dead and live calves.
[2]Adjusted for sex of calf and age of dam.
[3]Choice = 12, 13, 14; Good = 9, 10, 11.
[4]Equal emphasis to growth and to conformation.
[5]Artificially inseminated.

Growth of replacement heifers. All heifers in both years were bred and raised on the station. Five pounds of concentrate mixture was fed to these heifers during winter on pasture. Feeding usually begins about November 15 and continues until approximately March 1. They are fed for 90-110 days, depending on weather conditions and growth of native forages in the spring.

Heifers born in 1967 (table 5).

Brangus (Fat): Growth rate of the Brangus heifers showed that the low fat heifers grew faster than their contemporaries in the high fat.

Angus (Fat): The low fat heifers were heavier and the growth rate was more rapid than the high fat females. Differences were much less than the Brangus.

Angus (Adaptability): Numbers are small for this group. It appears that heifers from the local line are somewhat heavier and tend to grow at a faster rate.

Heifers born in 1968 (table 6).

Brangus (Fat): The low fat heifers are heavier and faster growing than the high fat females.

Angus (Fat): The growth pattern of these heifers is similar to the Brangus heifers except that they are smaller.

Angus (Adaptability): Numbers are so small for the heifers in the outside line that differences are negligible.

Table 5. Growth of Replacement Heifers Born in 1967.

Breed	Line	No.	Yrlg. wt. (lbs)	Wt./day of age (lbs)	18 mos. wt. (lbs)	Wt./day of age (lbs)	24 mos. wt. (lbs)	Wt./day of age (lbs)
Brangus	Hi Fat	12	422	1.16	567	1.04	540	.74
Brangus	Lo Fat	22	442	1.21	591	1.08	591	.81
Angus	Hi Fat	16	366	1.00	473	.87	506	.69
Angus	Lo Fat	17	401	1.10	514	.94	522	.72
Angus	Local Adapt.	11	384	1.05	482	.88	499	.68
Angus	Outside Adapt.	6	372	1.02	462	.85	461	.63

Table 6. Growth of Replacement Heifers Born in 1968.

Breed	Line	No.	Yearling Wt. Lbs.	Wt./day of age
Brangus	Hi Fat	15	421	1.28
Brangus	Lo Fat	16	443	1.39
Angus	Hi Fat	12	377	1.11
Angus	Lo Fat	14	410	1.22
Angus	Adapt. Local	15	368	1.09
Angus	Adapt. Outside	7	362	1.16

Postweaning performance of bulls - 1968. Bull calves are immediately placed in dry lot and full-fed in groups. Each bull in the fat study is fed to a constant weight of 800 pounds (table 7). At this weight, fat thickness is estimated over the 12th and 13th ribs with an ultrasonic instrument. The three bulls in each breed with the highest thickness of fat are retained for breeders in the high fat line and those in the low fat line with the least fat thickness are kept for replacements in each breed - Angus and Brangus.

Bull calves in the adaptability study are fed to a constant age of 365 days for each one. Growth rate and conformation are evaluated and an index is computed for each bull.

Equal emphasis is given to each trait. The three bulls with the highest indexes in the "local" line are kept for replacements. No replacement bulls are retained in the "outside" line.

Fifty percent or more of the bull progeny are slaughtered for carcass evaluation with samples of calves from each of the sires in the fat and the adaptability investigations (table 7).

Brangus Bulls (Fat): The only major difference between the high and low fat lines is the growth rate. Bulls in the low fat line gained faster.

Angus Bulls (Fat): Differences between the low and high lines are small and insignificant.

Angus Bulls (Adaptability): Only two bulls completed the test for the "outside" line. In examining data of previous years the growth rate has been essentially the same between the two lines. Conformation and slaughter grades were one-third of a grade higher for the "local" bulls.

Table 7. Postweaning Performance of Bulls Fed in 1967-1968.

Breed Study Line	Brangus Fat Hi Fat	Brangus Fat Lo Fat	Angus Fat Hi Fat	Angus Fat Lo Fat	Angus Adaptability Local	Angus Adaptability Outside
No. in group	17[a]	18[b]	15[c]	10[d]	13[e]	2[f]
Avg. initial wt.	423	402	338	331	348	338
No. days fed	170	160	195	204	185	187
Avg. final wt.	802[g]	802[g]	800[g]	801[g]	764[h]	731[h]
ADG on test	2.23	2.50	2.37	2.31	2.25	2.10
Avg. age end test (days)	348	338	375	385	365	365
Avg. type score[1]	9.7	10.1	11.0	10.7	12.6	11.2
Avg. condition score[1]	9.4	9.4	10.8	10.1	11.8	10.1
Fat thickness (mm.)[2]	8.9	7.9	9.8	8.6	----	----
Fat thickness (inches)	0.35	0.31	0.38	0.34	----	----
% Zebu	38.23	37.46	none	none	none	none
% Inbreeding	2.72	2.08	none	none	none	none
Index	none	none	none	none	109	108

[a]24 bulls on test - 17 finished and 3 died - 4 did not finish test.
[b]24 bulls on test - 18 finished and 1 died - 2 did not finish test.
[c]18 bulls on test - 15 finished and 3 died.
[d]14 bulls on test - 10 finished and 2 sold - 2 did not finish test.
[e]14 bulls on test - 13 finished test and 1 died.
[f]3 bulls on test - 2 finished test and 1 died.
[g]Each bull fed to a weight constant of 800 pounds.
[h]Each bull fed to an age constant of 365 days.

[1]Choice = 12, 13, 14; Good = 9, 10, 11.
[2]Measured when each bull reached 800 pounds.

Slaughter Data of Bulls - 1968.

Brangus (Fat): It is interesting to observe that the quality carcass grade was one-third of a grade higher for the "high" fat bulls. The yield grade was in favor of the "low" fat bulls. The "low" fat bulls had more lean and less fat. Marbling was greater for the "high" fat calves. The "high" fat cattle were slightly more tender than similar bulls in the "low" fat line. (table 8).

Angus (Fat): The "high" fat bulls had a greater carcass weight per day of age than the "low" fat bulls. The quality carcass grade was one-third point higher for the "high" fat animals. The "low" fat bulls had a lower (better) yield grade than similar bulls in the "high" fat line. Marbling was identical between the lines. The "high" fat bulls were slightly more tender. It was also noted that the "high" fat cattle had a little more lean. (table 8).

Angus (Adaptability): Numbers are too small to make comparisons. (table 8).

Table 8. Slaughter Data of Bulls - 1967-1968.

Breed	Brangus	Brangus	Angus	Angus	Angus	Angus
Study	Fat	Fat	Fat	Fat	Adaptability	
Line	Hi Fat	Lo Fat	Hi Fat	Lo Fat	Local	Outside
No. slaughtered	16	11	11	9	6	2
Slaughter age (days)	420	394	425	413	438	404
Days fed	238	213	225	232	223	248
Final wt. (feed lot)	872	854	885	808	815	856
Slaughter wt.[1]	841	825	852	776	806	836
Carcass wt. (cold)	493	481	509	465	524	472
Dressing % (cold)	58.66	58.30	59.74	59.92	61.79	58.52
Carcass wt./day of age	1.22	1.26	1.23	1.16	1.24	1.20
Carcass grade - quality	10.0	9.1	11.2	10.1	11.0	8.5
Carcass grade - yield[2]	2.43	2.20	2.03	1.94	2.40	1.20
Kidney fat %[2]	3.12	2.40	3.32	2.60	3.40	2.00
Ribeye area - actual (sq. inches)	10.60	10.90	12.08	10.82	10.22	11.74
Ribeye area/100 lbs. carcass (sq. inches)	2.15	2.26	2.37	2.32	1.95	2.48
Marbling	10.0	7.0	8.7	8.7	10.2	6.5
Shear test[3]	19.31	21.41	16.45	17.71	15.15	11.0
Fat thickness over ribeye (mm.)[4]	13.4	11.3	12.4	10.0	16.3	6.7
Fat thickness over ribeye (inches)	0.52	0.43	0.48	0.38	0.64	0.26

[1]Estimated at plant just before slaughter.
[2]Estimated by federal grader.
[3]One (1) inch core - deep fat method of cooking.
[4]Measured at three (3) places and average.

3. Diseases and injuries

Anaplasmosis: The year 1968 was severe for anaplasmosis. There were 17 cases detected. Five animals died. In most of the fatal cases, the cattle died shortly after treatment, within 10 hours. Two cows that recovered from the disease aborted a few days after treatment.

There were very likely other cases of anaplasmosis among the cattle which did not show visible symptoms or which the men were not able to detect. These animals recovered on their own. All the treated cases of anaplasmosis occurred in the Angus breed except for one Brangus cow.

Parainfluenza: All cattle on feed in the barn were inoculated for parainfluenza. No respiratory difficulties were noted among the cattle on feed. In 1967, several bulls on feed test in the barn died from parainfluenza.

Navel infection: Navel infection was less trouble in 1968. Only three calves came down with infection - two were Brangus and one was an Angus.

Disease prevention: All cattle over one year of age were inoculated against anthrax.

All calves were vaccinated for blackleg and malignant edema in the spring and again in the autumn when the calves were about six months old.

All cattle on feed in the barns were vaccinated for parainfluenza in late fall (November).

After cattle were on feed test for 90 days, ammomium chloride was administered daily in the feed to prevent urinary calculi. All cattle were periodically treated for internal parasites and liver flukes.

As soon as insects were noticed in the spring, backscratchers were installed and treated periodically to control external parasites.

Replacement heifers were inoculated for brucellosis at eight months of age.

Footrot: Only four cases of footrot were noted. All of these occurred among animals on feed in the barns.

Injuries: An Angus bull injured his sheath and was successfully treated.

An Angus heifer fell in a hole in a culvert in the marsh and had to be destroyed.

A mature Angus bull fractured a hind leg while fighting and was destroyed.

V. IMPROVEMENT OF FACILITIES:

Lanes were constructed at Annex to facilitate movement of cattle from pastures to central pens and scales.

VI. FUTURE PLANS:

1. To follow plans of project.

2. Improvement of facilities.

Complete construction of fenced lanes from pastures at Annex to working pens.

Build roof over working chute at Annex to permit its use during rain and inclement weather.

Build two small holding pens with loading chutes at locations at Annex to prevent having to drive cattle across a busy highway and two railroads and also to keep from having to drive injured or sick animals long distances (1-1/4 miles).

Repair culvert bridges at Annex.

VII. PUBLICATIONS:

DeRouen, T. M., W. L. Reynolds, D. C. Meyerhoeffer, H. C. Gonsoulin and N. T. Poche. 1968. Beef Cattle Research at the Iberia Livestock Experiment Station. Eighth Livestock Producers' Day report, Dept. of Ani. Sci., L.S.U. and Agriculture Exp. Sta., Baton Rouge.

Reynolds, W. L., D. C. Meyerhoeffer and T. M. DeRouen. 1968. Different silages and molasses for beef steers. J. Animal Sci. 27:296. (Abstr.).

Reynolds, W. L., T. W. White, T. M. DeRouen and D. C. Meyerhoeffer. 1968. Effect of nutritional level on repeatability of steer gain. J. Animal Sci. 27:1135. (Abstr.).

VIII. PUBLICATIONS PLANNED:

1. Review of the old project.

2. Growth patterns of replacement heifers at the Iberia Station.

3. Study of shrink in cattle.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Louisiana

Location		Jeanerette	Jeanerette	Jeanerette	Jeanerette	
Breed of sire		Brangus	Brangus	Angus	Angus	
Breed of dam		Brangus	Brangus	Angus	Angus	
Line or group[1]		Hi Fat	Lo Fat	Hi Fat	Lo Fat	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1969	Cows 2 years and over	61	56	61	56	
	Yearling heifers	14	16	9	14	
	Bulls and steers under 1 year	17	10	11	16	
	Heifers under 1 year	24	18	12	16	
	Bulls over 1 year	9	9	8	8	
	Steers over 1 year	0	0	0	0	
Repro. perf.	Percent pregnant[2]	88	67	80	78	
	Calf survival percent[3]	89	90	88	100	
Wean. perf.	Adj. ADG[4]	1.74	1.86	1.44	1.47	
	Av. type sc.[5]	10.1	10.5	11.2	11.0	
Postweaning performance	No. of bulls	17	22	16	19	
	No. of heifers	22	17	13	13	
	No. of steers	0	0	0	0	
Slaughtered	No. of bulls	7	13	13	16	
	No. of heifers	0	0	0	0	
	No. of steers	0	0	0	0	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: sex of calf, age of dam to a bull.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Louisiana

Location		Jeanerette	Jeanerette			
Breed of sire		Angus	Angus *			
Breed of dam		Angus	Angus			
Line or group[1]		Local	Outside			
Percent used in project		100	100			
Inventory as of July 1, 1969	Cows 2 years and over	51	30			
	Yearling heifers	13	7			
	Bulls and steers under 1 year	16	11			
	Heifers under 1 year	18	8			
	Bulls over 1 year	11	(A.I.)0			
	Steers over 1 year	0	0			
Repro. perf.	Percent pregnant[2]	62	65			
	Calf survival percent[3]	94	90			
Wean. perf.	Adj. ADG[4]	1.39	1.23			
	Av. type sc.[5]	11.4	10.6			
Postweaning performance	No. of bulls	18	10			
	No. of heifers	15	9			
	No. of steers	0	0			
Slaughtered	No. of bulls	9	6			
	No. of heifers	0	0			
	No. of steers	0	0			
Remarks		*Artificial insemination				

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

MISSISSIPPI STATE UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Hatch 3-207-666

A study to determine the breeding worth of inbred and outbred bulls from various sources.

II. OBJECTIVES:

To compare pre- and postweaning growth rates, market grades, carcass qualities, and maternal ability of the progenies of potentially superior sires selected from various sources.

III. PERSONNEL:

C. E. Lindley, Fay Hagan, C. B. Shawver, and L. J. Smithson

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weaning weights and grades were obtained on calves born in 1968, sired by inbred and selected bulls from the Virginia Station.

The preweaning performance summary is presented in the following table.

Average Performance in 1968 Calf Crop

Sire line	Day of birth	Birth wt.[a]	Avg. daily gain[a]	Weaning grade	210 day weight[a]	% cows calving	% cows wean. calves	No. of calves
1	2-23	64	1.51	11.0	382	76	68	17
2	3-5	62	1.56	10.8	390	75	70	14
3	3-6	65	1.46	10.3	342	60	60	15
4	3-10	64	1.52	10.5	383	82	59	13
7	3-2	64	1.54	10.9	389	78	61	14
8	3-9	62	1.60	11.0	398	79	75	18

[a]Heifer calves adjusted to steer basis.

The averages for steers born in 1967, which were finished and slaughtered on June 24, 1968 are given in the following table.

Averages for Angus Steers Slaughtered in 1968.

Sire line	ADG on feed[a]	Hot carcass wt.	Carcass grade	Carcass length	Leg length	Circ. round	Loin length	Chest width	Chest depth 5th	Dressing percent[b]	Loin eye area	Fat cover	Yield grade
1	1.96	515	12.8	43.4	26.2	29.8	21.9	8.6	12.5	59.19	10.29	0.66	3.5
2	1.86	503	12.2	44.0	26.4	29.8	22.5	8.3	12.8	57.78	10.28	0.42	2.6
3	1.46	452	12.25	44.2	26.4	28.3	22.5	8.4	12.9	57.67	10.01	0.41	2.4
4	1.91	499	12.67	44.0	26.4	29.4	22.4	8.4	13.0	56.49	10.93	0.48	2.5
7	1.96	520	12.8	44.8	26.9	30.7	22.6	8.5	12.9	57.70	10.76	0.46	2.7
8	2.05	531	12.0	44.1	26.5	30.8	22.5	8.4	12.8	56.98	10.80	0.49	2.7
Outbred	1.55	503	13.0	43.6	26.4	29.5	22.1	8.6	12.8	60.90	10.59	0.74	3.4

[a]Feeding period of 131 days.
[b]On chilled carcass basis.

The data on steers born in 1968 and slaughtered June 23, 1969 have not been completely compiled. They were carried on a wintering ration from November 12, 1968 to February 6, 1968, a period of 86 days. On February 6, they started on a finishing period of 137 days until slaughter. Data up to slaughter are given in the following table.

Post Weaning Data on Angus Steers Born in 1968.

Sire line	No. of steers	Wt. on winter ration	ADG winter ration	Wt. on finishing ration	ADG finishing	Wt. at slaughter	Total feed consumed	Lb. feed per lb. of gain
1	6	436	1.70	582	1.74	821	18619	12.98
2	6	412	1.83	569	1.92	832	17945	11.38
3	5	411	2.06	588	2.21	892	14177	9.34
4	6	441	1.70	588	2.02	864	20046	12.09
7	6	460	1.90	623	1.80	870	19790	13.35
8	6	436	1.68	580	1.65	807	16468	12.12
Outbred	6	463	1.85	622	1.90	882	20041	12.84

V. FUTURE PLANS:

For several years to come the line testing project in cooperation with the Virginia Station will be continued.

VI. PUBLICATIONS DURING THE YEAR:

Hagan, Fay, C. B. Shawver, C. E. Lindley and H. H. Callahan. 1968. Top and rotational crossing of Angus beef bulls from inbred and single-trait selection lines. Livestock Day Report. ASC Series 1-8.

VII. PUBLICATIONS PLANNED:

It is planned that the data from previous years be analyzed.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Mississippi

Location		Prairie				
Breed of sire		Angus				
Breed of dam		Angus				
Line or group[1]						
Percent used in project		100				
Inventory as of July 1, 1969	Cows 2 years and over	169				
	Yearling heifers	40				
	Bulls and steers under 1 year	68				
	Heifers under 1 year	58				
	Bulls over 1 year	16				
	Steers over 1 year	39				
Repro. perf.	Percent pregnant[2]	73.0				
	Calf survival percent[3]	94.9				
Wean. perf.	Adj. ADG[4]					
	Av. type sc.[5]					
Postweaning performance	No. of bulls		1968 calf crop			
	No. of heifers					
	No. of steers	41				
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	41				
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

NORTH CAROLINA STATE UNIVERSITY
Agricultural Experiment Station
Raleigh, North Carolina

I. PROJECT: Animal Science 1010

Direct and correlated response to selection for weaning weight and postweaning gain

II. OBJECTIVES:

1. To measure the effectiveness of selection to increase 205-day weight and postweaning gain to 365 days and to evaluate correlated responses in other traits.

2. To investigate phenotypic and genetic relationships between growth and milk production.

III. PERSONNEL:

W. T. Ahlschwede, E. U. Dillard, J. E. Legates, O. W. Robison, J. A. Vesely, J. J. Rutledge and T. N. Blumer

IV. ACCOMPLISHMENTS DURING THE YEAR:

Sixty-one bulls, 24 at Raleigh and 37 at Plymouth, finished postweaning gain test. Average daily gain from 205 to 365 days was 2.54 lb. at Raleigh and 2.45 lb. at Plymouth. The performance of selected bulls, to be used for 1970 matings, is shown in table 1 for the three lines. Non-selected bulls were slaughtered and carcass measurements made.

Semen was collected and frozen from the first set of selected bulls, born in 1967. This semen will be used in the 1969 breeding season. Semen quality was mediocre. The bulls were 18-22 months old at the time of collection.

Reproductive performance at Plymouth was exceptional. From a 90-day AI breeding season, 96 of 108 cows (2 years old and older in the herd at breeding time) calved. In the Raleigh herd 61 of the 99 cows and heifers in the breeding herd calved. The Raleigh herd was augmented by moving 13 cows from Plymouth.

Analysis of data from the completed genotype by environment interaction study indicated the sire x ration and sire by location interactions are not important sources of variation in postweaning performance of steers. Analysis of preweaning performance of calves and carcass evaluation data of the steers is pending.

V. FUTURE PLANS:

Manuscripts relative to the genotype-environment interaction study are to be prepared for publication. The selection project will be continued as outlined. Bulls will be held to more mature ages for collection in an attempt to improve semen quality.

Table 1. Selected Bulls (Born 1968)

No.	Sire	Adj. 205 Wt.		Sc.	Postweaning Gain		365 Wt.	Sc.
Line I Weaning Weight								
Ral 1	5012	449	+52[a]	12	411	+5[a]	867	14
Ral 15	6026	484	+87	11	361	-45	831	11
Ply 77	6635	481	+77	12	506	+114	979	13
Line II Postweaning Gain								
Ply 50	5012	417	+13	12	456	+64	883	14
Ral 8	6026	454	+57	9	476	+70	942	15
Ply 20	6635	352	-52	9	426	+34	761	11
Line III Control								
Ply 74	5012	378	-26	10	435	+43	800	11
Ral 25	6026	373	-24	10	384	-22	770	11
Ply 26	6635	312	-92	9	326	-66	641	9

[a]Deviations from herd averages

VI. PUBLICATIONS:

Ahlschwede, W. T., E. U. Dillard, J. E. Legates and O. W. Robison. 1969. Sire-environment interaction effects on steer growth. J. Animal Sci. 28:130. (Abstr.)

Ahlschwede, W. T., E. U. Dillard, J. E. Legates and O. W. Robison. Sire-environment interaction effects on steer growth and carcass grade. ANS Report No. 190. AB Series No. 17.

Ahlschwede, W. T., E. U. Dillard and J. E. Legates. Systematic crossbreeding in beef cattle. ANS Report No. 191. AB Series No. 18.

VII. PUBLICATIONS PLANNED:

Manuscripts directly concerned with genotype-environment study will be submitted. These will deal with preweaning performance, postweaning performance and carcass characteristics.

VIII. COOPERATING AGENCIES:

N. C. Department of Agriculture

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State North Carolina

Location		Raleigh	Plymouth			
Breed of sire		Hereford	Hereford			
Breed of dam		Hereford	Hereford			
Line or group[1]						
Percent used in project		100	100			
Inventory as of July 1, 1969	Cows 2 years and over	87	117			
	Yearling heifers	32	36			
	Bulls and steers under 1 year	26	52			
	Heifers under 1 year	33	42			
	Bulls over 1 year	8	10			
	Steers over 1 year	0	0			
Repro. perf.	Percent pregnant[2]	61	82			
	Calf survival percent[3]	81	92			
Wean. perf.	Adj. ADG[4]	1.58	1.62			
	Av. type sc.[5]	10.0	10.3			
Postweaning performance	No. of bulls	24	37			
	No. of heifers	32	36			
	No. of steers	0	0			
Slaughtered	No. of bulls	16	27			
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, sex

5 - Suggest S-10 scoring system; indicate if different.

CLEMSON UNIVERSITY
Agricultural Experiment Station
Clemson, South Carolina

I. PROJECT: SC-479 (S-10)

The response of sire progenies to management and feeding procedures.

II. OBJECTIVES:

To investigate the response of sire progenies, as measured by live animal and carcass traits to methods of producing slaughter cattle.

To evaluate the magnitude and importance of the average genotype with certain environmental influences.

To develop, through selection, herds of beef cattle with superior performance under South Carolina conditions.

III. PERSONNEL:

W. C. Godley; G. C. Skelley, Jr.; R. M. Rauton; R. F. Wheeler

IV. ACCOMPLISHMENTS DURING THE YEAR:

One hundred and twenty-six purebred Angus and 82 purebred Polled Hereford cows were put in the breeding herds to produce the 1968 calf crop. Pregnancy examinations revealed that fourteen of the cows were open. Approximately 19% of the cows were culled prior to calving because of the performance of their offspring. Calf mortality including those born dead was approximately 10%. Two sets of twins were produced during the calving season. Forty-five steer calves were fed on a postweaning feeding test. Detailed carcass information was obtained from these steers. Twelve Angus and six Hereford bull calves were fed on pasture on 140-day ROP feeding trial.

Weaning data on 820 calves and the weight and changes in weight of their dams were analyzed to evaluate the relationships between these parent and offspring traits. In addition, factors influencing the weight and changes in weight of the dams were studied.

Station, year and breed of dam significantly influenced the weight and changes in weight of Hereford, Polled Hereford and Angus cows. In addition, age and parous status had a significant effect on cow weight. The cows gained weight during the breeding season (Period I), during the suckling period (Period II), and during the 17 months from the beginning of the breeding season to weaning of the calf (Period III). Parous status significantly influenced changes in weight during all of the periods while age at calving significantly influenced changes in weight during Periods II and III.

Station of birth, year, birthweight, sex of calf, and creep feeding had significant effects on weaning weight. The actual weight of Angus cows at the beginning of the breeding season had a significant positive effect on the weaning weight of their calves. The weight of Hereford dams did not influence the weaning weight of their calves. However, change in weight during Period III and age at calving did influence the weaning weight and/or grade of Hereford calves.

Preweaning and weaning data on 509 calves and measures of size and condition of their dams were analyzed. Also, factors which were thought to influence size and condition of the dam were included in the study. In studying the factors influencing size and condition of dams, least squares constants were fitted for location, year and breed while age at calving, age at first calving and parous status were included as covariants.

Location, year, breed, age at calving, age at first calving, and parous status had significant effects on size score of the dam. Only age at first calving had a significant effect on weight of the dam at the beginning of the breeding season. Condition of the cow, as measured by a condition score, was not significantly influenced by location, year, breed, age at calving, age at first calving, or parous status. Weight of Hereford dams at the beginning of the breeding season was positively correlated with calf weight per day of age at 90, 120, 180 and 210 days of age, but no significant relationship was found for weight of Angus dams with calf weight per day of age.

Condition of Angus dams was positively correlated with 90 and 120 day weight per day of age of their calves while an increase in condition score of Hereford dams resulted in increased 120, 180 and 210 day weight per day of age of their calves.

A change in condition of the cow from April to weaning of their calf was negatively correlated with weight per day of age of their offspring. However, when adjusted for sex of calf, weight per day of age was only slightly influenced by change in condition of the dam.

Size score, as a measure of skeletal size of the cow, did not have a significant effect on preweaning growth rate of her calf. Effects of cow condition on calf growth rate appeared different for Angus and Herefords. Overall growth patterns for Angus and Hereford calves appeared to be the same with growth rate fastest up to 90 days of age.

V. FUTURE PLANS:

A new project is being planned.

VI. PUBLICATIONS DURING THE YEAR:

Tennant, Clifton O. 1968. Performance of beef calves as influenced by weight and weight changes of their dams. Master's Thesis. Clemson University Library.

Ramage, Daniel E. 1969. The influence of cow size and condition on calf performance. Master's Thesis. Clemson University Library.

VII. PUBLICATIONS PLANNED:

Manuscripts involving the influence of size and condition of dams on preweaning and postweaning performance of their offspring will be submitted.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State South Carolina

Location		Clemson	Clemson			
Breed of sire		Angus	Hereford			
Breed of dam		Angus	Hereford			
Line or group[1]		Purebred	Purebred			
Percent used in project		100	100			
Inventory as of July 1, 1969	Cows 2 years and over	131	40			
	Yearling heifers	35	7			
	Bulls and steers under 1 year	42	17			
	Heifers under 1 year	46	14			
	Bulls over 1 year	16	6			
	Steers over 1 year	0	0			
Repro. perf.	Percent pregnant[2]	90.0	87.5			
	Calf survival percent[3]	88.9	87.8			
Wean. perf.	Adj. ADG[4]	2.05	1.72			
	Av. type sc.[5]	13.08	11.30			
Postweaning performance	No. of bulls	12	6			
	No. of heifers	41	14			
	No. of steers	34	11			
Slaughtered	No. of bulls	6	4			
	No. of heifers	6	7			
	No. of steers	34	11			
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.

2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.

3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.

4 - Indicate adjustments: sex and age of dam.

5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF TENNESSEE
Agricultural Experiment Station
Knoxville, Tennessee

I. PROJECT: H-61 (S-10)

Improvement of producing ability of beef cattle.

II. OBJECTIVES:

1. To evaluate systematic breeding procedures.

2. To estimate genetic parameters and genetic environmental interactions of biological and economic traits.

3. To develop and evaluate selection criteria and selection procedures.

4. To determine the hereditary significance of recurring abnormalities.

III. PERSONNEL:

C. S. Hobbs, R. R. Shrode, W. L. Brown, J. A. Odom and J. H. Felts

IV. ACCOMPLISHMENTS DURING THE YEAR:

Calf performance records of 1102 calves and weights of their 326 dams were analyzed by least-squares procedures according to nine different mathematical models including various combinations of calf variables and cow variables. Calf variables included birth weight, age at weaning, average daily gain to weaning, type score at weaning, condition score at weaning and inbreeding coefficient. Cow variables included spring and fall weights. In addition, the usual variables of record were available such as sex of calf, age of cow and calving date. In general, spring and fall cow weights had a greater effect on calf performance than did annual change in weight of cow. Inbreeding of calf was significantly correlated with average daily gain, but not with type score or condition score. Correlations among variables were in general agreement, as expected, with the results of the various analyses of variance. Heritability estimates were 0.27 for birth weight, 0.45 for type score, 0.05 for condition score and 0.23 for average daily gain. In general, the results emphasize the importance of considering variables other than average daily gain to weaning in efforts to improve growth rate by selection.

Preliminary analyses to determine the usefulness of various body measurements in predicting postweaning gain of calves indicate that appreciable improvement can be attained in prediction ability by including in the prediction system various body measurements along with weaning age and weight over the prediction capability possible using weaning age and weight alone. Represented in the analyses were 74 Angus bull calves and 85 Angus heifer calves. Data were collected six different times between birth and a year of age, three times during the preweaning period and three times during the postweaning period. The body measurements recorded were heart girth, length

from withers to last rib, length from last rib to hips, length from hips to pins, width at hips and ultrasonically measured subcutaneous fat thickness. More refined analyses of the data are now being conducted, but the preliminary findings make it feasible to expect that including consideration of certain body measurements at weaning along with weaning gain data will make a worthwhile improvement in the effectiveness of selection at weaning when the objective is to improve rate and efficiency of growth.

V. FUTURE PLANS:

Revision of project will be implemented for 1969.

VI. PUBLICATIONS DURING THE YEAR:

Sanders, William L. 1968. Relationship between change in condition of beef cows during the pasture season and the performance of their calves to weaning. Ph.D. Dissertation. University of Tennessee.

VII. PUBLICATIONS PLANNED:

Shrode, R. R., W. L. Brown and C. S. Hobbs. Cow weight, cow weight change and calf traits in an Angus herd. Presented at 1969 meeting of ASAS at Purdue University.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Tennessee

Location		Crossville	Crossville	Greeneville		
Breed of sire		Angus	Angus	P. Hereford		
Breed of dam		Angus	Angus	P. Hereford		
Line or group[1]		Inbred	Non-Inbred			
Percent used in project		100	100	100		
Inventory as of July 1, 1969	Cows 2 years and over	41	141	78		
	Yearling heifers	9	19	27		
	Bulls and steers under 1 year	17	57	19		
	Heifers under 1 year	9	56	19		
	Bulls over 1 year			10		
	Steers over 1 year	0	0	0		
Repro. perf.	Percent pregnant[2]	80	85	78*		
	Calf survival percent[3]	85	90	86		
Wean. perf.	Adj. ADG[4]	1.86	1.92	1.79		
	Av. type sc.[5]	11.9	12.2	12.1		
Postweaning performance	No. of bulls	15	64	27		
	No. of heifers	15	75	27		
	No. of steers	0	0	0		
Slaughtered	No. of bulls	10	42	15		
	No. of heifers	0	0	0		
	No. of steers	0	0	0		
Remarks *Experienced outbreak of Leptospirosis						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: sex and age of dam.

5 - Suggest S-10 scoring system; indicate if different.

TEXAS A&M UNIVERSITY
Agricultural Experiment Station
College Station, Texas

I. PROJECT: H-2102

Breeding methods for beef cattle in the southern region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

N. M. Kieffer (leader) and T. C. Cartwright

IV. ACCOMPLISHMENTS DURING THE YEAR:

Studies of the relationship between degree of cellular interchange in bovine unlike sex twins and certain modification of the female genitalia have been completed. The data indicate that a negative correlation exists between XX/XY lymphocytes and depth of vagina. The vagina was blocked near the cervical opening in all cases. While these data tend to emphasize the role of the Y chromosome in the abnormal development of the female reproductive system, the data by no means excluded the role of the male hormone in causing abnormal development of the female reproductive tract.

Karyotyping of abnormal domestic animals continues. Thus far calves exhibiting the following abnormalities have been karyotyped: spastic paresis, "double muscle", dwarfism, hydrocephalus, and hermaphroditism. With the exception of the hermaphrodite, no pecularity of the karyotype could be correlated with the abnormality concerned. The phenotype of the hermaphrodite was more female than male and contained both a testis and an ovary. The sex composition of the testis was female, that is XX.

V. FUTURE PLANS:

The effect of age of mammalian eggs prior to fertilization on chromosomal aberrations will be investigated. Starting in the fall of 1968, 12 ewes were checked continuously for onset of estrus. Breeding was allowed at varying intervals after ovulation had been estimated to have occurred. The fertilized eggs were removed at intervals after mating, i.e., four, eight, 12, 16 days, etc., cultured in vitro and cytologically examined as to the chromosome complement. Any abnormalities found will be related to age of egg at time of fertilization. This research will be cooperative with Baylor Medical School and the College of Veterinary Medicine, Texas A&M University.

Examination of abnormal domestic animals for chromosomal abnormalities will be continued. One hundred and fifty County Agricultural Agents within a 250 mile radius of College Station have been asked to cooperate in locating abnormal animals. All animals reported will be checked for the relationship of the karyotype to the abnormality concerned.

Studies of determination of sex by examination of cells in amniotic fluid have been started. In cooperation with the College of Veterinary Medicine, amniotic fluid will be withdrawn from cows at about the 16th week of pregnancy and the cells cultured in vitro. The chromosomes will be examined for the sex chromosome composition.

Bovine sexual deviates will be used to establish the chromosomal basis of sexual development. The procedure will be to determine chromosomal composition from the blood, sacrifice the animal and determine chromosomal composition from gonadal tissue. The tissue will also be studied histologically.

VI. PUBLICATIONS:

Kieffer, Nat M., Margaret Treadwell, and T. C. Cartwright. 1968. Sex chromosome replication patterns in bovine chimeras. J. Animal Sci. 27:1127. (Abstr.).

Treadwell, Margaret A., Nat M. Kieffer, and T. C. Cartwright. 1968. Prophase I chromosome morphology in the bull. J. Animal Sci. 27:1130. (Abstr.).

Kieffer, Nat M., and T. C. Cartwright. 1968. Sex chromosome polymorphism in domestic cattle. J. of Heredity 59:34-36.

I. PROJECT: S-1547

Genetics of qualitative characters in beef cattle.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

D. F. Weseli (leader) and T. C. Cartwright

IV. ACCOMPLISHMENTS DURING THE YEAR:

Cooperative work involving collection of genetic blood typing data was initiated with the Agricultural Experiment Stations in Virginia and Tennessee. The Immunogenetics Laboratory at Texas A&M is to perform the blood typing tests on blood samples from the Virginia and Tennessee animals and compile the resulting blood type data. Texas A&M will also act in an advisory capacity on the interpretation of genetic blood type information. Blood typing has been completed for 410 cattle from Virginia and 85 from Tennessee.

Initial work was completed on analysis of genetic variants of milk proteins in beef cattle. Electrophoretic separation of α_{s1} and β caseins from Hereford, Angus, Charolais, Santa Gertrudis and Brahman cattle did not indicate the existence of genetic variants not also reported in dairy breeds, but the gene frequencies were different for each breed of beef cattle and also different from dairy breeds. Complete amino acid analyses of purified proteins from individual animals indicated that variability not detectable by electrophoresis did, in fact, exist in α_{s1} and β caseins of Hereford and Brahman milk. A previously unreported variant was also found in milk from a Holstein.

V. FUTURE PLANS:

Immunogenetics: Reagent production and standardization will continue. Final standardization of red blood cell typing test is expected soon. Blood typing will be initiated. Typing of current animals in cooperating S-10 herds of Texas, Virginia and Tennessee will continue. The data collected will include transferrin (β globulin) and hemoglobulin types, but not milk protein polymorphisms. The milk protein polymorphism study will be continued. Electrophoretic techniques will be expanded to include preliminary studies of other systemic proteins in beef cattle.

VI. PUBLICATIONS:

Caldwell, Jerry. 1968. A genetic and biochemical analysis of α_{s1}-casein and β-casein in the bovine species. Ph.D. Dissertation. Texas A&M University.

I. PROJECT: H-2101

Breeding methods for beef cattle in the southern region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

T. C. Cartwright (leader), H. A. Fitzhugh, Jr. and R. C. Thomas

IV. ACCOMPLISHMENTS DURING THE YEAR:

Research from this project led to an understanding of concepts and methods of performance testing and of hybridizing which increasingly predominate as guiding principles for breeders and teachers. Study of consequences of sustained use of performance testing and coordinated use of hybrid vigor includes descriptions of growth ($W_t = W_0 e^{A/\alpha(1-e\alpha t)}$, W_t = wt. at age t, α = rate of approach to maturity, A = initial proliferation rate of body mass.) Correlated effects of altering components of the growth pattern, direct and correlated effects on efficiency of TDN utilization, specific and general combining ability, and the combined effects of altered production and breeding systems have been examined. Optimum slaughter weight was found to vary for different growth patterns. Slaughtering steers at 750 pounds when the optimum is 1000 pounds decreases production efficiency about the same degree as a 10 percent reduction of net calf crop. For straightbred herds, smaller cattle produce a pound of calf at weaning more efficiently. Larger cattle produce a pound of steer taken to optimal slaughter weight more efficiently. Jersey-Angus cows, average weight 649 pounds, produced calves by Charolais averaging 681 pounds at 10 months of age. The results clearly show that current breeding goals and objectives of breeders and breed organizations are often illogical and result in cattle which utilize either single unit or state resources at submarginal efficiency. The principal deficiency is lack of specialization of breeders and of breeds.

V. FUTURE PLANS:

Continued work to characterize growth to maturity and correlated effects will continue to be emphasized. Milk production, maintenance requirements, optimum slaughter weights and optimum combination of breed characters are among the considerations more or less directly related to growth that are being considered. Comparisons of types which do not closely correspond to growth patterns of British breeds will begin during the year. These divergent types include Brahman and "double muscled" cattle. Emphasis on evaluating the potential of Jersey and Jersey-cross cows for efficiency of beef production will continue.

Study will be continued of the practice of early weaning to determine the ages of calves at which the nutrients consumed through feed become a major influence on the calf's gain. This will be determined by relating weekly TDN consumption from feed to gain versus the TDN consumption from milk. Data from Project 1583 will be used for this determination. At 30-day intervals around this age, calves of the same sire group and breeding will be weaned. Calves within each weaned-age group will be fed different levels of protein of different quality. In addition, all suitable cross-bred calves which can be paired by sire and breeding will be used in a comparison of weaning at 3 and 6 months of age.

Analysis of data from a Brahman herd will be completed. Data have been punched and most preliminary analyses have been accomplished. Involved are: 15,995 cow exposure years, 2061 dams, 350 sires, 9829 calves and information on a wide range of climatological and other environmental effects.

Computer simulation of herd composition and dynamics for sets of constraints will continue and probably be completed. Straightbred and various crossing systems are included.

VI. PUBLICATIONS:

Fox, J. D., H. A. Fitzhugh, Jr. and T. C. Cartwright. 1968. Accurate and efficient measurements of cattle weights. Dept. of Ani. Sci. Tex. A&M Univ. Tech. Rpt. 13.

Chapman, H. D. and T. C. Cartwright. 1968. Genetic trends in an experimental herd. J. Animal Sci. 27:283. (Abstr.)

Franke, D. E. and T. C. Cartwright. 1968. Estimating individual feed intake of group fed steers. J. Animal Sci. 27:284. (Abstr.).

Nelson, L. A. and T. C. Cartwright. 1968. Inter-age correlations among weights of heifers. J. Animal Sci. 27:284. (Abstr.).

Chapman, H. D. 1969. Response from selection in a herd of Brahman and Hereford cattle. Ph.D. Dissertation, Texas A&M Univ., College Station.

Thomas, R. C. and A. A. Melton. 1969. Beef cow size. Texas Agric. Progress 15:18.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Texas

Location		McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire		A	B	H	L	G
Breed of dam		A	B	H	L	G
Line or group[1]		100	100	100	100	
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	65	15	194	30	
	Yearling heifers	13	5	33	6	
	Bulls and steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year	4	5	22	11	3
	Steers over 1 year			36		
Repro. perf.	Percent pregnant[2]	95	87	90	74	
	Calf survival percent[3]	88	53	83	50	
Wean. perf.	Adj. ADG[4]	1.99	2.15	1.90	2.29	
	Av. type sc.[5]					
Postweaning performance	No. of bulls	12	2	36	5	9
	No. of heifers	13	5	28	4	5
	No. of steers	2		10		5
Slaughtered	No. of bulls			6		
	No. of heifers					
	No. of steers			7		
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age only, 180 days.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Texas

Location		McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire		J	A	L	L	B
Breed of dam		J	1x	H	1x	4x
Line or group[1]		100				
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	10	4	7	2	6
	Yearling heifers	2		2	5	
	Bulls and steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year	2				
	Steers over 1 year	1				
Repro. perf.	Percent pregnant[2]	100	100	92	91	83
	Calf survival percent[3]	60	75	85	82	60
Wean. perf.	Adj. ADG[4]	1.74	2.22	2.24	2.28	2.31
	Av. type sc.[5]					
Postweaning performance	No. of bulls	4		2	1	
	No. of heifers	2	2	2	4	3
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers			2		
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Texas

Location		McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire		B	B	BS	BS	H
Breed of dam		23x	24x	1x	H	57x
Line or group[1]						
Percent used in project						
Inventory as of July 1, 1969	Cows 2 years and over	3	4	24	12	
	Yearling heifers	2	1		9	9
	Bulls and steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year					
	Steers over 1 year					
Repro. perf.	Percent pregnant[2]	67	83	100	89	
	Calf survival percent[3]	50	60	89	82	
Wean. perf.	Adj. ADG[4]	1.92	2.26	1.94	2.03	
	Av. type sc.[5]					
Postweaning performance	No. of bulls	1	3	4	1	
	No. of heifers	2	1			1
	No. of steers					
Slaughtered	No. of bulls					1
	No. of heifers					
	No. of steers				1	4
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Texas

Location		McGregor	McGregor	McGregor	McGregor	McGregor
Breed of sire		L	L	L	L	A
Breed of dam		15x	72x	73x	82x	J
Line or group[1]						
Percent used in project						
Inventory as of July 1, 1969	Cows 2 years and over	4	2		2	35
	Yearling heifers	2		1		14
	Bulls and steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year					
	Steers over 1 year					
Repro. perf.	Percent pregnant[2]	75	50		62	85
	Calf survival percent[3]	60	50		38	77
Wean. perf.	Adj. ADG[4]	2.34	2.31		2.51	1.93
	Av. type sc.[5]					
Postweaning performance	No. of bulls	1	3	2	4	
	No. of heifers	5	2	2	4	2
	No. of steers	1	4	1	1	
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	1	4	1	1	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Texas

Location		McGregor	McGregor	McGregor		
Breed of sire		L	BS	BS		
Breed of dam		A	A	BS		
Line or group[1]						
Percent used in project						
Inventory as of July 1, 1969	Cows 2 years and over	4	1			
	Yearling heifers		3			
	Bulls and steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year			1		
	Steers over 1 year					
Repro. perf.	Percent pregnant[2]	75	100			
	Calf survival percent[3]	50	100			
Wean. perf.	Adj. ADG[4]	1.74	2.03			
	Av. type sc.[5]					
Postweaning performance	No. of bulls					
	No. of heifers	4	2			
	No. of steers					
Slaughtered	No. of bulls	1	1			
	No. of heifers					
	No. of steers	1	1			
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

CATTLE BREED & CROSS CODES

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
A	Angus	Angus	Angus
B	Brahman	Brahman	Brahman
BA	Brangus	Brangus	5/8 A - 3/8 B
BM	Beefmaster	Beefmaster	S - H - B
BS	Brown Swiss	Brown Swiss	Brown Swiss
C	Charbray	Charbray or Charolais	3/4, 7/8 L - 1/4, 1/8 B
G	Santa Gertrudis	Santa Gertrudis	Santa Gertrudis
H	Hereford	Hereford	Hereford
I	Holstein	Holstein	Holstein
J	Jersey	Jersey	Jersey
L	Charolais	Charolais	Charolais
R	Red Poll	Red Poll	Red Poll
RA	Red Angus	Red Angus	Red Angus
RB	Red Brangus	Red Brangus	Red Brangus
S	Shorthorn	Shorthorn	Shorthorn
U	Sussex	Sussex	Sussex
1x	Hereford	Brahman	1/2 H - 1/2 B
2x	Brahman	Hereford	1/2 B - 1/2 H
3x	1x & 2x	Hereford	3/4 H - 1/4 B
4x	1x	Brahman	3/4 B - 1/4 H
5x	3x & 9x	Hereford	7/8 H - 1/8 B
6x	Angus breeding, predominate		

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
7x	Brahman	1x & 2x	3/4 B - 1/4 H
8x	4x & 23x	Hereford	5/8 H - 3/8 B
9x	Hereford	1x & 2x	3/4 H - 1/4 B
10x	3x,5x & 9x	Charolais	5/8 L - 3/8 H
11x	Hereford	Santa Gertrudis	1/2 H - 1/2 G
12x	Hereford	Red Poll	1/2 H - 1/2 R
13x	1x	Santa Gertrudis	1/2 G - 1/4 H - 1/4 B
14x	1x	Red Poll	1/2 RP - 1/4 H - 1/4 B
15x	Hereford	Charolais	1/2 H - 1/2 L
16x	1x & 2x	Charolais	1/2 L - 1/4 H - 1/4 B
17x	Charbray	Hereford	1/2 C - 1/2 H
18x	Santa Gertrudis breeding, predominate		?
19x	Brahman breeding, predominate		?
20x	Charolais or Charbray breeding, predominate		?
21x	1x	1x & 2x	1/2 H - 1/2 B (inter se)
22x			
23x	4x	Brahman	7/8 B - 1/8 H
24x	23x	Brahman	15/16 B - 1/16 H
25x	24x	Brahman	31/32 B - 1/32 H
26x	Hereford	Charbray	1/2 H - 7/16 L - 1/16 B
27x	26x	Charolais	3/4 L - 1/4 H
28x	27x	Charolais	7/8 L - 1/8 H
29x	28x	Charolais	15/16 L - 1/16 H
30x			
31x			

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
32x	11x	Santa Gertrudis	3/4 G - 1/4 H
33x	32x	Santa Gertrudis	7/8 G - 1/8 H
34x	33x	Santa Gertrudis	15/16 G - 1/16 H
35x			
36x	Brahman	Charbray	9/16 B - 7/16 L
37x	36x	Charolais	3/4 L - 1/4 B
38x	37x	Charolais	7/8 L - 1/8 B
39x	38x	Charolais	15/16 L - 1/16 B
40x			
41x			
42x	13x	Santa Gertrudis	3/4 G - 1/8 H - 1/8 B
43x	42x	Santa Gertrudis	7/8 G - 1/16 H - 1/16 B
44x	43x	Santa Gertrudis	15/16 G - 1/32 H - 1/32 B
45x	58x	Hereford	3/4 H - 1/4 BS
46x	58x	Brown Swiss	3/4 BS - 1/4 H
47x	10x	Charolais	13/16 L - 3/16 H
48x	47x	Charolais	29/32 L - 3/32 H
49x			
50x			
51x	Red Poll	Santa Gertrudis	1/2 R - 1/2 G
52x	51x	Santa Gertrudis	3/4 G - 1/4 R
53x	52x	Santa Gertrudis	7/8 G - 1/8 R
54x	53x	Santa Gertrudis	15/16 G - 1/16 R
55x			

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
56x	B	Brown Swiss	1/2 B - 1/2 BS
57x	1x	Brown Swiss	1/2 BS - 1/4 H - 1/4 B
58x	H	Brown Swiss	1/2 BS - 1/2 H
59x	57x	Hereford	1/4 BS - 5/8 H - 1/8 B
60x	57x	Brown Swiss	3/4 BS - 1/8 H - 1/8 B
61x	14x	Santa Gertrudis	1/2 G - 1/4 R - 1/8 H - 1/8 B
62x	61x	Santa Gertrudis	3/4 G - 1/8 R - 1/16 H - 1/16 B
63x	62x	Santa Gertrudis	7/8 G - 1/16 R - 1/32 H - 1/32 B
64x	63x	Santa Gertrudis	15/16 G - 1/32 R - 1/64 H - 1/64 B
65x			
66x	1x & 2x	Charbray	7/16 L - 1/4 H - 5/16 B
67x	66x	Charolais	3/4 L - 1/8 H - 1/8 B
68x	67x	Charolais	7/8 L - 1/16 H - 1/16 B
69x	68x	Charolais	15/16 L - 1/32 H - 1/32 B
70x			
71x	15x	Charbray	11/16 L - 1/4 H - 1/16B
72x	15x	Charolais	3/4 L - 1/4 H
73x	72x	Charolais	7/8 L - 1/8 H
74x	73x	Charolais	15/16 L - 1/16 H
75x			
76x	3x, 5x & 9x	Charbray	7/16 L - 3/8 H - 3/16 B
77x	76x	Charolais	3/4 L - 3/16 H - 1/16 B
78x	77x	Charolais	7/8 L - 3/32 H - 1/32 B

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
79x	78x	Charolais	15/16 L - 3/64 H - 1/64 B
80x			
81x	16x	Charbray	15/32 L - 1/4 H - 9/32 B
82x	16x	Charolais	3/4 L - 1/8 H - 1/8 B
83x	82x	Charolais	7/8 L - 1/16 H - 1/16 B
84x	83x	Charolais	15/16 L - 1/32 H - 1/32 B
85x			
86x	13x	Charbray	7/16 L - 1/4 G - 1/8 H - 3/16 B
87x	86x	Charolais	3/4 L - 1/8 G - 1/32 H - 3/32 B
88x	87x	Charolais	7/8 L - 1/16 B - 1/64 H - 3/64 B
89x	88x	Charolais	15/16 L - 1/32 G - 1/128 H - 3/128 B
90x	89x	Charolais	
91x	Brahman	Charolais	1/2 L - 1/2 B
92x	91x	Charolais	3/4 L - 1/4 B (Charbray)
93x	92x	Charolais	7/8 L - 1/8 B (Charbray)
94x	93x	Charolais	15/16 L - 1/16 B
95x	Coop. cattle		5/8 L - 1/4 B - 1/8 S
96x	Coop. cattle		1/4 R - 1/4 B - 1/8 H - 1/8 J
97x	Coop. cattle		3/4 H - 1/4 B (approx.)
98x	Coop. cattle		R - B
99x	Coop. cattle		B - J
100x	1x	Angus	

VIRGINIA POLYTECHNIC INSTITUTE
Animal Science Department
Blacksburg, Virginia

I. PROJECT: 206100 (S-10)

Heterosis from crosses among British breeds of beef cattle.

II. OBJECTIVES:

To measure heterosis obtained from crosses among the Angus, Hereford, and Shorthorn breeds, as shown by growth rate, fattening ability, and carcass quality.

III. PERSONNEL:

J. A. Gaines, W. H. McClure, R. C. Carter, G. W. Litton and F. S. McClaugherty

IV. ACCOMPLISHMENTS DURING THE YEAR:

The first calf crop of the "interim phase" (between phases two and three) was slaughtered. The main basis of comparison is: straightbred calves from straightbred dams versus crossbred calves from crossbred dams. The summary of the data is as follows:

		Wean. Wt.	Slau. Wt.	ADG on feed	Dress. %	Loin eye area	Car. Wt.	Slau. Gr.	Car. Gr.
Steers	straight	472	906	2.22	59.3	10.35	536	11.9	11.7
	cross	549	977	2.18	59.5	11.40	582	12.2	11.6
Heifers	straight	454	750	1.43	58.3		439	11.7	10.7
	cross	482	790	1.51	58.2		461	11.9	11.1

There are noteworthy differences in weaning weight, slaughter weight, and carcass weight.

The second calf crop of the "interim" phase was born in early 1969, and will be weaned in October.

Females for the phase three cow herd have been produced under contract, and will be purchased in the fall of 1969.

V. FUTURE PLANS:

The "interim" phase may be continued through a third calf crop, depending on the availability of funds and facilities.

Phase three females will assemble, and plans for phase three will be implemented.

VI. PUBLICATIONS:

Carter, R. C., J. A. Gaines and W. H. McClure. 1968. Heterosis in fertility from breed crossing of cattle. Proc. XII International Cong. of Genetics (Tokyo)I:275.

Gaines, J. A., R. C. Carter and W. H. McClure. 1968. Heterosis from beef cattle crossbreeding. Proc. of Second World Conf. on Animal Prod.

Gaines, J. A., W. H. McClure and R. C. Carter. 1968. Heterosis from crossing three British breeds of beef cattle. Va. Journal of Sci. 19:166. (Abstr.).

I. PROJECT: S-031-8 (S-10)

Evaluation of the effectiveness of selection for economic traits in beef cattle.

II. OBJECTIVES:

To obtain estimates of genetic parameter from field data to include (a) heritability and repeatability of traits, (b) phenotypic and genetic correlations and (c) construction of selection indexes.

To study the factors influencing the sale price of ROP bulls.

To evaluate the effectiveness of selection on the improvement of beef cattle under farm conditions.

III. PERSONNEL:

T. J. Marlowe, C. E. Thompson, G. A. Waugh and G. L. Zabel

IV. ACCOMPLISHMENTS DURING THE YEAR:

The study of factors influencing the sale price of performance-tested bulls was completed and published in the Journal of Animal Science.

The evaluation of contemporary progenies produced in the same herd and year from two groups of Culpeper ROP bulls with birth dates differing by five or more years was continued in the Whitethorne herd for Herefords and in the Fleetwood herd for Angus. There are approximately 200 calves in this year's crop for both breeds. Approximately 150 cows were bred by AI during March and April for the final calf crop in the first phase of procedure II of the last objective shown above.

The relation of dam's condition score at weaning to the subsequent growth rate of her progeny was studied based on 274 Angus cows and their 438 progeny and 174 Hereford cows and their 285 progeny. The dams were grouped according to their condition scores at weaning, within breed, and a simple one-way ANOVA for unequal subclass numbers was done on both the dam's unadjusted preweaning ADG and the progeny's adjusted preweaning ADG. No more than two and always the first two progeny records were used. The ADG of the dams was significant ($P \leq .01$) between groups for both breeds. However, the adjusted ADG of their progeny were not significantly different, although there was a downward trend in calf ADG as the condition scores of the Angus dams increased. No such trend existed among the Hereford group. A regression procedure by Ostle (1963) of progeny's ADG on dam's ADG within and between dam groupings failed to show any significant differences except for condition groupings 3 and 4 of the Angus.

Another study of the dam's season of birth on the preweaning performance of her progeny was conducted. Data consisted of Virginia BCIA records on 463 dams and their 926 progeny in eight Angus herds. Cows were classified as fall-born (August-November) or spring-born (February-May) within each calf crop year and the two groups compared, within herd and year, both on their own preweaning ADG and on the adjusted ADG of their progeny. Only the first two records were used. The dam's preweaning ADG were 1.42 and 1.61 pounds for fall and spring-born dams, respectively, and the differences were highly significant. The mean adjusted ADG of the progeny was the same for both groups, 1.66 pounds. The regression coefficient of offspring adjusted ADG on dam's unadjusted ADG was computed, also. It was negative, but very low, -.016.

These findings failed to support the hypotheses that faster gaining and/or fat heifer calves at weaning turn out to be poor milking dams. It should be pointed out, however, that the growth rate was quite low even in the faster gaining group, too low perhaps to cause any damage to the developing secretory tissue. Also, the number of observations in the high condition group was quite small for both breeds.

V. FUTURE PLANS:

After the 1970 calf crop is weaned, all of the data will be summarized to determine the progress made through performance testing of bulls. A follow-up evaluation will be made in about four or five years which will provide contemporary comparisons of sires differing in birth dates by ten or more years.

A study is now under way to estimate the genetic change in BCIA herds by comparing the change in performance of half-sibs (from dams of the same age) by the same sire over two or more years with the overall mean change in performance in the same herds during the same years. The environmental change will be estimated by comparing the performance of full-sibs in successive years, after correcting the age of dam. By subtracting first the genetic change then the environmental change from the total change, alternate estimates of the two components can be obtained and compared.

Another study is under way to estimate the repeatability of cow performance in BCIA herds.

VI. PUBLICATIONS DURING THE YEAR:

Marlowe, T. J. 1969. Bull selection criteria as indicated by sale price. J. Animal Sci. 28:437.

Marlowe, T. J. 1968. Factors buyers emphasize when they purchase bulls. Am. Hereford Jour. 45th Annual Herd Bull Edit., July 1, 1968. p 412.

Marlowe, T. J. and A. L. Eller, Jr. 1968. Culpeper ROP bulls compared to other bulls in BCIA herds. 1967-68 Livestock Research Report, VPI Research Div. p. 12.

Marlowe, T. J. and C. E. Thompson. 1969. Effect of dam's season of birth on preweaning performance of progeny. 1968-69 Livestock Research Report.

Marlowe, T. J. and G. L. Zabel. 1969. Relation of dam's condition score at weaning to the subsequent growth rate of her progeny. 1968-69 Livestock Research Report.

Waugh, G. A. and T. J. Marlowe. 1968. Environmental effects on growth of yearling cattle. J. Animal Sci. 27:1137. (Abstr.).

VII. PUBLICATIONS PLANNED:

1. Repeatability of cow performance in BCIA herds.

2. Evaluation of effectiveness of selection in BCIA herds.

BEEF CATTLE RESEARCH STATION
Front Royal, Virginia

I. PROJECT: AH 150.16 AH Line Project d1-4 (S-10)

The improvement of beef cattle for Virginia through breeding methods.

II. OBJECTIVES:

To compare changes in performance and breeding values from two breeding systems: (a) single trait mass selection, and (b) the formation of intensely inbred lines for subsequent use in top and rotational crossing.

To evaluate selection criteria and procedures and to develop more precise and effective measures of quality and performance in beef cattle.

To simplify methods of individual, progeny, and sib testing so that the performance of breeding cattle can be evaluated at young ages.

III. PERSONNEL:

B. M. Priode, K. P. Bovard, R. C. Carter, E. J. Warwick, P. A. Putnam and W. T. Butts, Jr.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work undertaken:

Levels of inbreeding in calves and cows of the inbred lines rise at about 1% per year after the initial 25% Fc that arises from foundation sire-daughter matings. The exact change for each line from one year to the next may vary 2 - 5% because of changes in the inbred herd sire and additions of replacement females.

Fc and Fd had consistently negative highly significant effects on inbred calves' conformation and growth to weaning. Further, the inbred lines were significantly different from each other in their average response to the same level of inbreeding.

In cooperation with the Texas Station, blood samples will be taken from all cattle in the Front Royal breeding project. Changes in frequencies of certain antigens will be related to those expected for the calculated inbreeding levels in each line. First blood was drawn and shipped to Texas in August 1968.

In the farm press two attempts have been made to explain the Front Royal inbreeding program. Work with Angus was discussed in the September, October and November issues of Angus Topics. That in Herefords is in press, to appear in later summer or early fall 1969.

Thirty-two surplus pregnant cows were placed in a supplementary winter feeding study. It compared conventional and non-protein nitrogen (NPN) with levels of energy in feeding apple pomace silage.

2. Research results:

Simple means compared. Performance through ROP was compared among two highly inbred lines, the type and the growth selection lines of both the Angus and the Shorthorn breeds. Simple means from 419 calves across years 1966-68 made up the comparisons.

Non-inbred bulls were 46 lbs. heavier than inbreds at weaning; 141 lbs. heavier at one year.

Non-inbred heifers were 42 lbs. heavier than inbreds at weaning; 54 lbs. (only an extra 12 lbs.) heavier at one year.

Weight differences between type and growth selection calves were striking: Growth bulls were 33 lbs. heavier than type bulls at weaning, 115 lbs. heavier at one year. Growth heifers were 6 lbs. heavier than type heifers at weaning, 9 lbs. heavier (only an extra 3 lbs.) at one year.

Differences in type scores clearly favored the non-inbreds over the inbreds, and type selection calves over growth calves, about 1.0 unit in type score in both cases at both weaning and one year.

A 55% inbred bull calf, #9041 MA2, was born in March. The calf was five generations removed from the A2 foundation sire through its female line of descent, but had only two sires appearing in its path pedigree: the foundation sire, 057, and his 25% inbred son, 0218. This example nicely illustrates the kind of intense inbreeding that is possible when both fertility and longevity of sires are satisfactory.

An abnormality, tentatively called the LDJ (lethal defective jaw) syndrome has appeared in one Hereford inbred line. To date four calves, all 31% inbred from sire-daughter matings of one non-inbred sire, have shown the defect. Symptoms include deficient or lacking skeletal development of the outer tip of the mandible, incisors detached, with puffy growth of lower lip tissue.

V. FUTURE PLANS:

Diallel testing of the four inbred lines in Angus and Shorthorns will begin in June 1969, continuing for five years. Growth selection lines in Angus and Shorthorns will be continued as previously handled. Type selection lines in Angus and Shorthorn breeds will be terminated beginning in 1969. The Hereford breeding studies, both inbred and selection, will be terminated beginning in 1969. Topcross tests with inbred and selection lines will be continued as planned. Those with Shorthorns are being conducted cooperatively with the Blacksburg (Virginia) Station; those with Angus are being done with the Mississippi Station.

VI. PUBLICATIONS:

Bovard, K. P. and B. M. Priode. 1968. Estimates of beef cows' mature size from annual fall weights at Front Royal. Presented at the Second World Congress of Animal Production, College Park, Md., July 1968. (Abstr.).

Bovard, K. P., J. P. Fontenot, D. F. Watson and B. M. Priode. 1968. Heptachlor residues in beef cows and calves. J. Animal Sci. 27:1131.(Abstr.).

Rumsey, T. S., K. P. Bovard, S. M. Shepherd and B. M. Priode. 1968. DDT residues in beef cows fed apple pomace. J. Animal Sci. 28:418-424.

Bovard, K. P., R. H. Miller and B. M. Priode. 1969. Inbred beef calves' type and growth to weaning. J. Animal Sci. 28:133. (Abstr.).

VII. PUBLICATIONS PLANNED:

Meacham, T. N., K. P. Bovard and B. M. Priode. 1969. Effects of supplemental vitamin A on the performance of beef cows and their calves. (In press).

McDaniel, Robert C., R. C. Carter and W. T. Butts, Jr. 1969. Influence of condition on maternal performance of beef cows. J. Animal Sci. 28: (In press).

Waugh, Gary A. and Thomas J. Marlowe. 1969. Environmental influences on growth rate and grade of yearling beef cattle. J. Animal Sci. (In press).

Krehbiel, E. V., R. C. Carter, K. P. Bovard, J. A. Gaines and B. M. Priode. 1969. Effects of inbreeding and environment on fertility of beef cattle mating. J. Animal Sci. (In press).

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire		Angus	Angus	Angus	Angus	Angus
Breed of dam		Angus	Angus	Angus	Angus	Angus
Line or group[1]		A1	A2	A3	A4	A7
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	20	22	17	17	36
	Yearling heifers	4	4	4	6	0
	Bulls and steers under 1 year	7	7	11	4	21
	Heifers under 1 year	7	9	3	5	11
	Bulls over 1 year	2	3	2	2	1
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	75	75	63	74	78
	Calf survival percent[3]	83	73	83	64	87
Wean. perf.	Adj. ADG[4]	1.84	1.70	1.84	1.80	1.82
	Av. type sc.[5]	12.1	11.6	11.3	11.2	12.9
Postweaning performance	No. of bulls	3	3	3	2	4
	No. of heifers	4	4	4	6	12
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire		Angus	Angus	Angus	Angus	Hereford
Breed of dam		Angus	Angus	Angus	Angus	Hereford
Line or group[1]		A6	A8	A9	Total	H2
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	9	28	0	149	15
	Yearling heifers	12	0	0	30	5
	Bulls and steers under 1 year	14	0	0	64	6
	Heifers under 1 year	15	0	0	50	7
	Bulls over 1 year	3	2	0	15	1
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	82	0	0	76	87
	Calf survival percent[3]	84	0	0	81	100
Wean. perf.	Adj. ADG[4]	2.04	0	0	1.87	1.32
	Av. type sc.[5]	12.1	0	0	12.1	10.4
Postweaning performance	No. of bulls	4	0	2*	21	4
	No. of heifers	12	0	0	42	8
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0

Remarks *two bulls on ROP test from outside breeders.

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire		Hereford	Hereford	Hereford	Hereford	Hereford
Breed of dam		Hereford	Hereford	Hereford	Hereford	Hereford
Line or group[1]		H3	H4	H5	H6	H7
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	21	10	20	36	37
	Yearling heifers	1	0	6	0	10
	Bulls and steers under 1 year	4	5	4	17	13
	Heifers under 1 year	13	4	12	14	15
	Bulls over 1 year	2	1	3	1	0
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	74	80	82	59	82
	Calf survival percent[3]	94	94	100	100	96
Wean. perf.	Adj. ADG[4]	1.77	1.67	1.75	1.69	1.72
	Av. type sc.[5]	11.2	11.9	12.5	12.6	12.1
Postweaning performance	No. of bulls	3	2	3	3	4
	No. of heifers	6	6	7	9	11
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire		Hereford	Hereford	Hereford	Shorthorn	Shorthorn
Breed of dam		Hereford	Hereford	Hereford	Shorthorn	Shorthorn
Line or group[1]		H8	H9	Total	S1	S2
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	32	0	171	19	17
	Yearling heifers	2	0	24	2	5
	Bulls and steers under 1 year	21	0	70	5	5
	Heifers under 1 year	9	0	74	5	4
	Bulls over 1 year	2	2	12	2	3
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	74	0	76	74	78
	Calf survival percent[3]	83	0	94	86	79
Wean. perf.	Adj. ADG[4]	1.88	0	1.69	1.56	1.50
	Av. type sc.[5]	12.0	0	11.8	10.6	11.4
Postweaning performance	No. of bulls	4	2*	25	3	2
	No. of heifers	10	0	57	2	5
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks		*two bulls on ROP test from outside breeders.				

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal	Front Royal	Front Royal
Breed of sire		Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of dam		Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Line or group[1]		S4	S5	S7	S8	S9
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1969	Cows 2 years and over	22	15	18	38	0
	Yearling heifers	3	5	0	8	0
	Bulls and steers under 1 year	6	2	12	18	0
	Heifers under 1 year	4	4	5	9	0
	Bulls over 1 year	2	2	1	3	0
	Steers over 1 year	0	0	0	0	0
Repro. perf.	Percent pregnant[2]	94	63	76	79	0
	Calf survival percent[3]	62	58	90	89	0
Wean. perf.	Adj. ADG[4]	1.62	1.49	1.79	1.95	0
	Av. type sc.[5]	11.7	11.9	12.9	11.9	0
Postweaning performance	No. of bulls	3	2	4	4	1*
	No. of heifers	3	5	13	8	0
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks	*One bull on ROP test from outside breeder.					

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.

5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1968-1969

State Virginia

Location		Front Royal	Front Royal	Front Royal		
Breed of sire		Shorthorn	Purebred	Various		
Breed of dam		Shorthorn	Purebred	Various		
Line or group[1]		Total	Herd total	Crossbred		
Percent used in project		100	100	100		
Inventory as of July 1, 1969	Cows 2 years and over	129	449	0		
	Yearling heifers	23	77	0		
	Bulls and steers under 1 year	48	182	0		
	Heifers under 1 year	31	155	1		
	Bulls over 1 year	13	40	0		
	Steers over 1 year	0	0	0		
Repro. perf.	Percent pregnant[2]	77	76	100		
	Calf survival percent[3]	86	86	83		
Wean. perf.	Adj. ADG[4]	1.72	1.75	2.33		
	Av. type sc.[5]	11.9	11.9	11.8		
Postweaning performance	No. of bulls	19	65	0		
	No. of heifers	36	135	0		
	No. of steers	0	0	0		
Slaughtered	No. of bulls	0	0	0		
	No. of heifers	0	0	0		
	No. of steers	0	0	0		
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent or percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.

5 - Suggest S-10 scoring system; indicate if different.